

ENTREPRENEURIAL BEHAVIOUR OF FARMERS PRACTICING SUSTAINABLE AGRICULTURE



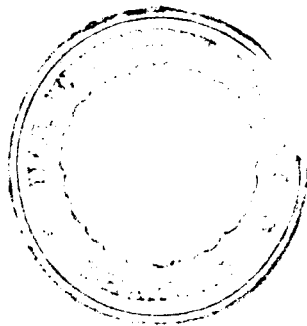
N. NOMESH KUMAR

**DEPARTMENT OF AGRICULTURAL EXTENSION
UNIVERSITY OF AGRICULTURAL SCIENCES
BANGALORE**

1998

ENTREPRENEURIAL BEHAVIOUR OF FARMERS PRACTICING SUSTAINABLE AGRICULTURE

N. NOMESH KUMAR



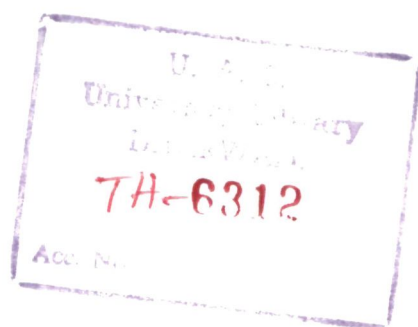
Thesis submitted to the
University of Agricultural Sciences, Bangalore
in partial fulfilment of the requirements
for the award of the Degree of

Master of Science (AGRICULTURE)

in
AGRICULTURAL EXTENSION

BANGALORE

SEPTEMBER 1998



**DEPARTMENT OF AGRICULTURAL EXTENSION
UNIVERSITY OF AGRICULTURAL SCIENCES
BANGALORE**

C E R T I F I C A T E

*This is to certify that the thesis entitled "**ENTREPRENEURIAL BEHAVIOUR OF FARMERS PRACTICING SUSTAINABLE AGRICULTURE**" submitted by **Mr. N. NOMESH KUMAR** for the award of degree of **MASTER OF SCIENCE in AGRICULTURAL EXTENSION** to the University of Agricultural Sciences, Bangalore is a record of research work done by him during the period of his study in this University, under my guidance and supervision and the thesis has not previously formed the basis for the award of any degree, diploma, associateship, fellowship or other similar titles.*

Bangalore
September , 1998



(B.K. Narayana Swamy)
Chairman, Advisory Committee

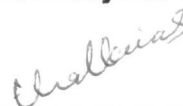
Approved by :

Chairman



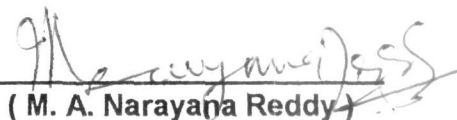
(B. K. Narayana Swamy)

Members 1.



(Challaiah)

2.



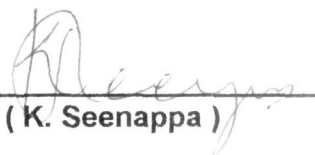
(M. A. Narayana Reddy)

3.



(M.P. Gokul Raj)

4.



(K. Seenappa)

ACKNOWLEDGEMENT

I shall be immensely indebted to Dr. B.K. Narayana Swamy, Chairman of my advisory committee and Associate Professor, Directorate of Extension, for his constant encouragement right from the beginning of my Post Graduate Program and his valuable guidance and candid counselling without him my research endeavours would not have fructified.

I thanks to Dr. Challaiah, Training Co-ordinator for his help and encouragement during the study period.

My Sincere thanks to Dr. M.A. Narayana Reddy, Professor of Horticulture, UAS, Bangalore, for his valuable suggestions and guidance throughout the course of this study.

Suggestions, criticisms, help and encouragement of Mr. M. P. Gokul Raj, Associate Professor, Department of Agriculture Extension, received during the course of this study are sincerely and gratefully acknowledged.

My special thanks to Mr. K. Seenappa, Associate Professor, Department of Statistics, for his help, suggestions and co-operation throughout this study.

I owe great and heartfelt thanks to Dr. V. Veerabhadraiah, Professor and Head, Department of Agricultural Extension for his constructive suggestions and criticisms during the study period.

It gives me immense pleasure to place on record my heartfelt thanks to Dr. S. Bisaliah, Vice Chancellor, University of Agricultural Sciences, Bangalore for his encouragement throughout the period of my study

The process of acknowledgement is incomplete without expressing my sincere gratitude to Mr. K. Krishnamurthy, Associate Professor, Department of

Statistics, Dr. K. Nagabushanam, Associate Professor, Farmers Training Institute, Dr. B.V.Chinnappa Reddy, Associate Professor, Department of Agricultural Economics, for their affection, concern and constant inspiration during a course of the study.

My loyal regards to Dr. G. Eshwarappa, Chief Instructor, Farmers Training Institute, Mr. S. Jaganath, Associate Professor, Department of Horticulture, Dr. J. Venkatesh, Associate Professor, Department of Horticulture, Dr. M. Bharathi, Professor and Head, Department of Sociology and Mr. T. N. Anand, Associate Professor, Department of Extension, for their constant help during my study period.

My special thanks to Mrs. Bhagyamma for her moral support which acted as the driving force to achieve my goals with perfection.

I wish to offer my thanks to my brothers N. Jayadeva Naik, Laxmipathi, Venkatesh, Kadaresh, and Sudhir, sisters Sowbhagya S. Naik and R. Rukminibai, brother-in-laws Sacriyanaik and Dr. L. Rudranaik who had shown keen interest in completing work early.

I also thank my friends Resmy, Senthil, Vasanth, Sarvagna, Shashidhar, Shivaramane, Sampath, Sidhu, Binu, Kathir, Prakash, Srikanth chavan, Kumar, Narasimha murthy and others, for their support throughout the study period.

The excellent typing Mr. Chandarshekar is heartfully acknowledged.

Place : Bangalore


(N. NOMESH KUMAR)

CONTENTS

Chapter	Title	Page
I	INTRODUCTION	1 - 12
II	REVIEW OF LITERATURE	13 - 42
III	MATERIALS AND METHODS	43 - 56
IV	RESULTS	57 - 102
V	DISCUSSION	103 - 118
VI	SUMMARY	119 - 128
VII	REFERENCES	129 - 138
	APPENDICES	139 - 171

LIST OF TABLES

Table No.	Title	Page No.
I.	Details of respondent farmers belonging to different states of the country	59
II.	Details of responses received from judges belonging to different countries of the world	60
III.	Broad items of standardized sustainable agricultural practices	62
IV.	Sub-items of standardized sustainable agricultural practices	63-64
V.	Age group of farmers practicing sustainable agriculture	65
VI.	Educational level of farmers practicing sustainable agriculture	66
VII.	Family size of farmers practicing sustainable agriculture	68
VIII.	Agricultural land owned by farmers practicing sustainable agriculture	69
IX.	Mass media exposure of farmers practicing sustainable agriculture	70
X.	Organisational participation of farmers practicing sustainable agriculture	72
XI.	Extension participation of farmers practicing sustainable agriculture	73
XII.	Relative importance of the entrepreneurial behaviour components of farmers practicing sustainable agriculture	75
XIII.	Sustainable agricultural practices adopted by farmers	77

Table No.	Title	Page
XIV.	Sustainable agricultural practices adopted in different crops by farmers	78
XV.	Irrigation facility of farmers practicing sustainable agriculture	80
XVI.	Large animals owned by farmers practicing sustainable agriculture	81
XVII.	Constraints faced by farmers in adoption of sustainable agriculture	83
XVIII.	Sustainable agricultural practices adopted by farmers under different age groups	84
XIX.	Sustainable agricultural practices adopted by farmers under different educational level	86
XX.	Sustainable agricultural practices adopted by farmers and their size of land holdings	87
XXI.	Sustainable agricultural practices adopted by farmers and their organisational participation	89
XXII.	Sustainable agricultural practices adopted by farmers and their extension participation	90
XXIII (a)	Entrepreneurial behaviour and age group of farmers practicing sustainable agriculture	92
XXIII (b)	One way analysis of variance of entrepreneurial behaviour of farmers practicing sustainable agriculture in different age groups	92
XXIV (a)	Entrepreneurial behaviour and educational level of farmers practicing sustainable agriculture	93
XXIV (b)	One way analysis of variance of entrepreneurial behaviour of farmers practicing sustainable agriculture in different educational level	93

Table No.	Title	Page
XXV. (a)	Entrepreneurial behaviour and agricultural land owned by farmers practicing sustainable agriculture	95
XXV. (b)	One way analysis of variance of entrepreneurial behaviour of farmers practicing sustainable agriculture and land owned by them	95
XXVI. (a)	Entrepreneurial behaviour and organisational participation of farmers practicing sustainable agriculture	96
XXVI. (b)	One way analysis of variance of entrepreneurial behaviour of farmers practicing sustainable agriculture and their organisational participation	96
XXVII. (a)	Entrepreneurial behaviour and extension participation of farmers practicing sustainable agriculture	98
XXVII. (b)	One way analysis of variance of entrepreneurial behaviour of farmers practicing sustainable agriculture and their extension participation	98
XXVIII.	Correlation between judges opinion and farmers adoption of sustainable agricultural practices	99
XXIX.	Correlation between sustainable agricultural practices adoption index and entrepreneurial behaviour index	100

LIST OF FIGURES

Figure No.	Title	Between pages
I.	Socio economic characteristics of farmers practicing sustainable agriculture	73-74
II.	Relative importance of entrepreneurial behaviour index of farmers practicing sustainable agriculture	75-76
III.	Sustainable agricultural practices adopted by farmers	77-78
IV.	Sustainable practices adopted in different crops by farmers	78-79
V.	Irrigation facility of farmers practicing sustainable agriculture	80-81
VI.	Large animals owned by farmers practicing sustainable agriculture	81-82
VII.	Constraints faced by farmers in adoption of sustainable agriculture	83-84
VIII.	Entrepreneurial behaviour and age group of farmers practicing sustainable agriculture	92-93
IX.	Entrepreneurial behaviour and educational level of farmers practicing sustainable agriculture	93-94
X.	Entrepreneurial behaviour and agricultural land owned by farmers practicing sustainable agriculture	95-96
XI.	Entrepreneurial behaviour and organisational participation of farmers practicing sustainable agriculture	96-97
XII.	Entrepreneurial behaviour and extension participation of farmers practicing sustainable agriculture	98-99

INTRODUCTION

CHAPTER 1

INTRODUCTION

Population growth inevitably leads to over exploitation of the natural resources resulting in future deterioration of the resource base and lower productivity potential. A massive application of science and technology has enabled Indian agriculture to face the serious challenges of poverty, food security and malnutrition in the recent past. As the time progressed with all the constraints the nature and characters of agricultural research has also changed with the past experience. Agriculture is frequently at the center of discussion related to sustainability due to known environmental problems resulting from farm activities.

FAO reports that sustainable agriculture should involve the successful management of the resources for agriculture to satisfy changing human needs while maintaining or enhancing the quality of environment and conserving natural resources (Anonymous, 1989). In many countries of the world great emphasis is being given in recent years on development of sustainable agriculture. Solutions to problems of sustainability of agriculture production do not rest with science and technology alone. They also require vigorous socio-economic and entrepreneurial research in order to understand the constraints for adoption of sustainable agriculture.

Agriculture development is a complex process, sustainable agriculture development is an extremely complex process. Sustainable agriculture as the management and conservation of the resource base, the orientation of technological and institutional changes in such a manner has to ensure the attainment and continued satisfaction of human needs for present and future generations. Such sustainable development is environmentally friendly, technically appropriate, economically viable and socially acceptable.

The development of any nation depends primarily on the important role played by entrepreneurs. Hence, the part played by entrepreneurs is of vital importance in a developing country like India, where there are ample opportunities for using sustainable agricultural innovations to exploit the available resources. Thus in all economic development activities more attention is being given to entrepreneurship development. An entrepreneur is primarily concerned with changes in the formula of production over which he has full control. Further, it is commonly believed that an entrepreneur is basically an intelligent person and has a definite ability to create some thing new to prove its worthiness.

The entrepreneurial behaviour is not necessarily doing new things but also doing things in a new way that has been already done. An entrepreneur is primarily concerned with changes in the formula of production over which he has full control. The

entrepreneur is an economic man, who strives to maximise his profits by adoption of innovations. However, entrepreneurs are not simply innovators, they are men with a will to act, to assume risk and to bring about a changes through organisation of human efforts (Dannof, 1949). There is now a growing awareness that the economic growth and development of the advanced countries is largely due to entrepreneurship among their community rather than to capital.

A considerable amount of research about the personal qualities and behaviour of entrepreneurs has been conducted in recent years but the precise identification of entrepreneurial talent remains elusive. More research is needed in this new field of entrepreneurship to yield further insights into our growing body of knowledge about this difficult area. As yet, however, this identification process, using psychological tests and related methods remains more of an art than a science. While numerous studies have yielded important insights into entrepreneurship, it is important to recognize that the available knowledge represents the tip of the ice berg, with areas of agreement, as well as continuing debate (Anonymous, 1996a).

The future progress of farming in the country depends on the entrepreneurial behaviour of farmers. Human development report says that the global gap between the rich and the poor is widening every day (Anonymous, 1996b). The fact is that about 500 million people of India are dependent on agriculture. The world wide bibliography on entrepreneurial research prepared by east west

centre Hawaii reports that studies on behaviour of entrepreneurs in agriculture are very limited. As indicated by World Development Report there is no difference between the goals of development policy and appropriate environmental protection. Both must be designed to improve welfare (Anonymous, 1992).

The present study would be in the interest of the country to use and invest in sustainable agriculture. The entrepreneurial behaviour of farmers practicing sustainable agriculture has not been studied in a systematic way. Eventhough number of studies have been conducted in India to find out differential characteristics of farmers in adopting farm practices. Most of these studies have tried to find out association between adoption and farmers knowledge, attitude, personal and socio-psychological characteristics. Further, these studies have not been tried to investigate on the role of farmers entrepreneurial behaviour. However, only few researches have been conducted in India on agricultural entrepreneurs.

In a heterogeneous and stratified society like India, it is not adequately realized that the characteristics which distinguish entrepreneurship may not be uniform for its different strata, what could be entrepreneurial activity in a particular section of the population may not be considered so in other sections. Presently, development of farmers for adoption of sustainable agriculture is the primary concern of the country. The role played by entrepreneurs also assumes greater importance. Thus, there is an urgent need for

conducting research on the entrepreneurial behaviour of farmers for adoption of sustainable agriculture. This research is aimed at finding out facts, results of such a study will be very useful for extension educators, programme planners, administrators, policy and decision makers in designing new strategies for adoption of sustainable agriculture in the country. Hence, this study is an attempt to find out the entrepreneurial behaviour of farmers practicing sustainable agriculture.

Specific objectives of the study

- (1) To identify and standardize sustainable agricultural practices.
- (2) To study the socio-economic characteristics of farmers practicing sustainable agriculture.
- (3) To observe entrepreneurial behaviour responsible for adoption of sustainable agriculture.
- (4) To formulate recommendations for adoption of sustainable agriculture in the country.

OPERATIONAL DEFINITIONS OF THE TERMS USED IN THIS RESEARCH

1. Independent variable

Independent variable is the presumed cause of the (Dependent variable) presumed effect.

2. Dependent variable

Dependent variable is the presumed effect which varies concomitantly with the change or variation in independent variable.

3. Intervening variable

Intervening variable is the term coined to indicate the internal and unobservable psychological process which some times being expressed in terms of behaviour.

4. Adoption

Adoption is the decision by an individual farmer to adopt the new idea or practice of sustainable agriculture in his farm over a period of time.

5. Entrepreneurial behaviour

Entrepreneurial behaviour is too complex phenomenon to be explained by a single factor. It is a combination of several factors or components. However, entrepreneurial behaviour is defined as a combination of seven components viz., Innovativeness, Decision making ability, Achievement motivation, Information seeking ability, Risk taking ability, Co-ordinating ability and Leadership ability. The combined contribution of the above seven factors to an individual behaviour is being expressed in terms of entrepreneurial behaviour.

6. Sustainable Agriculture

7

Sustainable agriculture is a complex phenomenon, difficult to define by a single agricultural practice. However, Sustainable agriculture is defined as a proper combination and appropriate use of seven sustainable agricultural practices viz., Organic Farming, Integrated Farming, Integrated Pest Management, Integrated Nutrient Management, Agro-forestry, Soil and Water Conservation and Bio-fertilizer use for conservation and management of natural resource base while preserving high productivity and quality of land with social and economic viability.

7. Organic Farming

Organic Farming is a system of agriculture which encourages nutrient recycling of organic matter to soil and using compost, crop residues, proper tillage and avoiding application of synthetic fertilizers and pesticides.

8. Integrated Farming

Integrated Farming is a system of sustainable farming where a set of practices were integrated into the farming system to achieve profits from the farming and at the same time help to save the environment.

9. Integrated Pest Management (IPM)

Integrated Pest Management is a holistic approach by integrating cultural, mechanical, physical, biological, chemical, genetic and regulatory methods to control pests.

10. Integrated Nutrient Management (INM)

8

Integrated Nutrient Management is a holistic approach by Judicious use of inorganic fertilizers along with organic and natural sources and bio-fertilizers to maintain and enrich soil fertility, sustainability and production levels.

11. Agro-forestry

Agro-forestry is a collective name for land use systems and technologies where woody perennials are deliberately used on the same land management unit as agricultural crops and animals in some form of special arrangements or temporal sequence.

12. Soil and Water conservation

Soil and water conservation is a scientific management of soil and water to enhance soil fertility, productivity and moisture conservation and to control soil erosion through different methods like bunding, tillage, constructing ponds etc.

13. Bio-fertilizer use

Microbial inoculants popularly known as bio-fertilizers refers to living or latent cells of efficient strains of micro organisms that are capable of fixing atmospheric nitrogen and mobilization of soil nutrients.

14. Natural Farming

Natural Farming is a system of farming where no alterations were made either to the soil or to the plant. The farming is taken care by nature.

15. Biodynamic Farming

9

Biodynamic Farming encompasses the use of special biodynamic sprays and composts which are prepared by using organic wastes like cowdung and some herbs which have got special properties. Biodynamic sprays totally avoid all forms of chemical fertilizers and pesticides.

16. Constraints

Constraints refer to some of the lacunae which hinder the adoption of sustainable agricultural practices.

17. Technological constraints

Technological constraints refer to some of the lacunae in the recommended sustainable agricultural technologies like inappropriateness, complex nature, non practicable etc. which affect the adoption of sustainable agriculture.

18. Service and supply constraints

Service and supply constraints are related to the non-availability of inputs and other services etc. for adoption of sustainable agriculture which affect the adoption of sustainable agriculture.

19. Infrastructural constraints

Infrastructural constraints are related to inadequate sale points of inputs, long distance to get inputs, non availability of timely and adequate inputs, inefficient quality control etc. which affect the adoption of sustainable agriculture.

20. Personal constraints

10

Personal constraints are related to individual like age, education, knowledge level, exposure etc. which affect the adoption of sustainable agriculture.

21. Socio-psychological constraints

Socio-psychological constraints refer to the aspects of an individual. These are related to lack of conviction, avoidance in risk taking, lack of awareness, skepticism, lack of aspiration, lack of community action etc. which affect the adoption of sustainable agriculture.

22. Information transfer constraints

Information transfer constraints are related to people to get the technology intine through participation. Inadequate or non-availability of local motivators to people for participation etc. which affect the adoption of sustainable agriculture.

23. Situational constraints

Situational constraints related to problematic soils, disease and pests in endemic areas and food requirement of the country which affect the adoption of sustainable agriculture.

24. Operational constraints

Operational constraints are related to the production with operation of technologies like size of land holdings, lack of appropriate implements etc. which affect the adoption of sustainable agriculture.

25. Organisational constraints

11

Organisational constraints are related to short comings of various organisations and institutions like non-availability of extension workers, staffing pattern etc. which affect the adoption of sustainable agriculture.

26. Economic constraints

Economic constraints are related to non-availability of credit, insufficient capital, more interest rate, low profitability, high cost of production etc. which affect the adoption of sustainable agriculture.

27. Policy constraints

Policy constraints are related to policy of the Government with respect to support price for produce, levies, crop insurance etc. which affect the adoption of sustainable agriculture.

28. Adhoc constraints

Adhoc constraints are those constraints that are related to breakdown of equipment, machinery, electricity, sudden pest out break etc. which affect the adoption of sustainable agriculture.

ORGANIZATION OF THIS RESEARCH

The present research study is organized as the introductory chapter I, followed by research review on relevant topics is presented in chapter II. The methods followed and materials used in conducting

this research is explained in chapter III. The results of the study and discussion of research results, summary and implications of the study have been presented in the order as chapter IV, V and VI. The references used for the research has been given in chapter VII. The questionnaire used for standardization of sustainable agricultural practices, the structured interview schedule, names and address of judges used for standardization of sustainable agricultural practices and farmers interview schedule for collection of data on adoption of sustainable agricultural practices and their entrepreneurial behaviour related to the research have been placed as Appendices (I to V) at the end of the thesis.

REVIEW OF LITERATURE

CHAPTER II

REVIEW OF LITERATURE

The study is one of the first of its kind. Hence, the literature available in this area of research is very limited. The main focus of this chapter is to present a resume of conceptual formulations pertaining to the entrepreneurial behaviour as well as sustainable agriculture. After thorough reviewing of literature it was observed that very limited attempt has been made in this area. However, keeping in view the objectives of the study, the related literature was reviewed and presented under the following headings.

2.1 SUSTAINABLE AGRICULTURE

- 2.1.1 Sustainable agriculture concept
- 2.1.2 Sustainable agriculture indicators and practices.
- 2.1.3 Sustainable agriculture conceptual frame work.

2.2 ENTREPRENEURIAL BEHAVIOUR

- 2.2.1 Entrepreneurship definitions.
- 2.2.2 Entrepreneurship factors.
- 2.2.3 Entrepreneurship of farmers.

2.1 SUSTAINABLE AGRICULTURE

2.1.1 Sustainable agriculture concept

The phrase "Sustainable agriculture" was coined by Lady Eve Balfour (Francis and Youngberg, 1990). The use of this concept is of recent origin and has become a buzz word for agricultural programmes in education, extension, research and government policy to take stock of effects on natural resources. This concept has been expressed in many ways by scientists in different situations.

Generally, it is not possible to define sustainable agriculture in terms of specific set of practices. A sustainable agriculture must be capable of continually evolving, while preserving the social and natural resources upon which it is based (Alteri, 1986).

For sustainable agriculture (Granatstein, 1988) suggested use of other terms such as 'natural', 'ecological', 'biological', 'alternative', 'low input' and 'regenerative' in contrast to 'high input', 'maximum production' and 'intensive agriculture'.

Sustainable agriculture as an integrated system of agriculture production that is less dependent on high inputs of energy and synthetic chemicals and more dependent on intensive management rather than conventional monocultural systems (Edwards, 1987)).

FAO in its report delineated sustainable agriculture as "management and conservation of the resource base and orientation of technological and institutional changes in such a manner as to ensure the present and future generations". Such sustainable

development is environmentally non-degrading, technically¹⁵ appropriate, economically viable and socially acceptable (Anonymous, 1991).

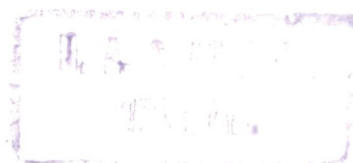
According to Ruttan (1989) definition of sustainability should include (a) development of technology and practices that maintain and /or enhance the quality of land and water resources and (b) improvement in plants and animals and advances in production practices that will facilitate substitution of biological technology for chemical technology.

Conway *et al.* (1991) opined that sustainability implies to less specialised farming, often requiring mixed crop/livestock farming for less dependence upon outside inputs, whereas adequate environmental protection with the intervention of issues.

Nagabushanam (1997) reported that sustainable agriculture is a process of adopting the eco-friendly practices which provide resource efficiency, an acceptable level of productivity, profitability and adequate environmental protection with the intervention of issues.

Jones (1993) stated that for developing countries, sustainability is maintaining food production or increase that trend while preserving or enhancing the underlying resource base and minimising wherever possible, of the dependence of production on external inputs.

TH 6312



Sustainable agriculture is the one which makes use of low cost inputs, less amount of chemical fertilizers, maintains soil fertility and ecological harmony and this should maintain or increase the biological productivity (Singh *et al.*, 1990).

Hess (1991) explains the term 'sustainable agriculture' as the use of the very best technology in a balanced, well managed and environmentally responsible system. It relies on skilled management, scientific know-how and on farm activities.

The sustainable/low -input agriculture has two criteria that agriculture should lower the costs and reduce negative impacts on soil and water resources. Thus, three broad areas of concern that seem to underline the concept of sustainable agriculture as proposed by (Ray, 1990) are : economic concerns, environmental concerns and public welfare concerns.

Sustainable agriculture is the one that equitably balances the concerns of environmental soundness, economic viability and social justice among sectors of society (Allen *et al.*, 1991).

Sustainable farming can be defined as one that fulfills both the current needs of the farmer in terms of providing the farm family with sufficient food to survive and/or producing a cash surplus yet, at the same time, it does not destroy future generations. On a basic level sustainability is living within one's means (Anonymous, 1990).

2.1.2 Sustainable agriculture indicators and practices

Research system has evolved many simple to complex technologies to sustain the agricultural development. Out of the available technologies, very few are being utilized in the real situation. There is no proper procedure in identifying the practices specifically for sustainable agricultural development. Many authors explained in many ways under different situations.

Sustainable production system should be directed towards three essential goals namely (1) food security, (2) employment (3) income generation, (4) natural resource conservation and (5) environmental protection (Pookpakdi, 1993).

No single agricultural method has a corner on sustainability. Any farming system whether chemical intensive or natural can be in some aspects resource-conserving and in other aspects wasteful, environmentally unsound or polluting. Simply substituting non-chemical alternatives may not necessarily make agriculture more sustainable (Dover and Talbot, 1987).

According to Hoods and Gupta (1995) most agreed definition of sustainable agriculture is "the appropriate use of crop and livestock system and the agriculture inputs supporting their activities which maintain economic and social viability while preserving the high productivity and quality of the land".

Singh *et al.* (1990) explained that sustainable agriculture as the one which makes use of low cost inputs, less amount of chemical

fertilizers, maintain soil fertility and ecological harmony. Further, they should maintain or increase the biological productivity.

The means to achieve greater agricultural sustainability are (1) biological diversity (2) crop rotations (3) animal integration (4) the soil as biological system (5) knowledge-based farming, (6) human scale farm size and (7) minimal dependence on non-renewable resources (Ray, 1990).

Edwards (1988) highlights the importance of fully integrating various practices for maximising benefits in sustainable agricultural systems ; legume rotations ; use of organic, animal and agricultural wastes ; integrated pest management, pest and disease forecasting ; biological and cultural pest control ; live mulches and mechanical weed control ; conservation tillage and specialized innovative cultural techniques such as intercropping, strip cropping, trap crops and double -row cropping.

Some of the manipulable components for attaining sustainability are : (a) improved cultivars and cropping systems, (b) conserving tillage and crop residue management ; (c) application of fertilizers and organic amendments and (d) water management (Lal and Miller, 1990).

Swaminathan (1989) opined that prevention of soil erosion, conservation and management of water resources, conservation of biological diversity using in-situ, ex-situ, in-vitro and in-vivo methods and promoting the spread and development of economically viable

and ecologically sound farm techniques which are the main components of a sustainable agricultural system.

The indigenous crops and plants yield more with less inputs. Conservation of rain water could be done by contour bunding, reduction of evaporation by growing trees, wind breaks, ground cover and mulch and drip irrigation. Green leaf manure, waste from coconut husk, organic waste along with occasional spraying of diluted cow's urine were found to be more effective. Planting of vetiver grass on the bunds, use of uprooted weeds for mulching and use of biogas slurry in composting were also identified as the most cost effective technologies in conserving natural resources (Erik, 1990).

Organic farming is a system of agriculture that encourages soils and crops through such practices as nutrient recycling of organic matter (such as compost and crop residues) crop rotations, proper tillage and the avoidance of synthetic fertilizers and pesticides application (Anonymous, 1996).

According to Baldwin (1991) vermi-composting is the process of using earth worms and micro-organisms to convert organic waste such as manure or household refuse to valuable compost. Earthworms help the farmers by decomposing organic matter, generating nutrient rich crust and opening channels in the soil thus, improving soil fertility and structure.

The concept of Integrated Pest Management (IPM) has a major role to play in enhancing agricultural sustainability, specifically with

regard to insect pests (to which the great majority of the effort has been applied to date), weeds (which have received relatively little IPM attention), and plant and animal diseases (Ray, 1990).

Khosla and Sunil (1991) explained that agro-forestry is a sustainable land use system that maintains or increases total yield by combining food (annual) crops with tree (perennial) crops and/or livestock on the same unit of land either alternating or at the same time using management practices that suits the social and cultural characteristics of the society and the economic and ecological condition of the area.

The sustainable land use requires a combination of production with conservation. Agro-forestry can contribute to this through control of erosion, maintenance and improvement of soil fertility, checking forest clearance and range land degradation and watershed management (Young, 1991).

Elongovan and Vasanthakumar (1997) identified eco-friendly technologies for Tamil Nadu state are (1) biofertilizer application, (2) green manuring, (3) vermicompost, (4) enriched farm yard manure (5) compost application (6) coir pith compost, (7) neem cake application, (8) IPM, (9) seed treatment with trichoderma, (10) afforestation, (11) nitrogen fixing trees, (12) neem seed kernel extract, (13) agro-forestry, (14) integrated farming system and (15) rice-fish-azolla culture.

2.1.3 Sustainable agriculture conceptual frame work

The conceptual frame work of sustainable agriculture is for understanding the means and how the farmers adopt the different practices to achieve the goal of sustainable agriculture is the question. Based on the review of researches the indicators and practices have created a dent of approaches to sustainable agriculture. These practices and indicators of sustainable agriculture are location specific. There is no hard and fast rule to select certain indicators to measure in a particular situation. However, the opinion of authors are too much comprehensive. But lack of directions for measurement of each indicator is the bottleneck. Under the present circumstances a set of indicators and practices identified through scientific procedure and used in the present study to know the adoption of sustainable agriculture by farmers. They were Organic Farming, Integrated Pest Management, Integrated Nutrient Management, Agro-forestry, Soil and Water conservation and Bio-fertilizer use.

2.2 ENTREPRENEURIAL BEHAVIOUR

2.2.1 Entrepreneurship definitions

Despite the fact that the entrepreneur has been defined and redefined by historians, economists, sociologists, psychologists and behavioural scientists, misconceptions arise in the minds of those who deal with entrepreneurs in the developmental process.

Examining the misconception/myths is one way of clarifying concepts in this regard. (Anonymous, 1996a).

Although the fresh physiocrats of the 18th century associated entrepreneurship with agriculture, in later years the term gradually assumed a primarily industrial connotation. Today, it is rarely used to refer to an agricultural activity. Pleading that the attributes required by successful farmers, particularly those producing cash crops, are in many ways similar to those commonly associated with industrial entrepreneurs (Anand Singh and Krishna, 1994).

According to Dannof (1949), an entrepreneur is primarily concerned with changes in the formula of production over which he has full control. The entrepreneur is an economic man, who strives to maximise his profits by innovations.

Dinesh (1992) states that entrepreneurial function, does not end with the launching and consolidation of an enterprise. Continuing search for new products, new markets and new technology to ensure sustained growth is essentially entrepreneurial in character.

It is commonly believed that an entrepreneur is basically an intelligent person and has a definite ability to create some thing new to prove its worthiness (Anonymous, 1996a). The entrepreneurial behaviour is not necessarily doing new things but also doing things in a new way that has been already done (Narayana Swamy, 1996).

Some scholars believe that the traditional meaning of entrepreneurship, confined to economic spheres alone, is too restrictive. There may be situations where creative individuals find it more satisfying to allocate their talents to non pecuniary activities, depending on the reward structure in a society (Joan Nix, 1992).

Cantillon (1755) drew attention to entrepreneur as a technical term. The essence of the function of the entrepreneur was to bear uncertainty. Further, Schumpeter (1947) viewed entrepreneur as a manager who was making creative or innovative response.

McClelland (1961) pointed out that the man who organizes the business unit and/or increases its productive capacity is an entrepreneur. Where as, Lockwood (1965) defined the entrepreneurship as the ability to recognise and exploit economic opportunity.

Lamb (1952) defined entrepreneurship as that form of social decision making performed by economic innovators, and thus entrepreneurship means broadly the ability to recognise and exploit economic opportunity. Further, Gordon (1961) stated that the entrepreneurs are not simply innovators in the sense of innovation, they are men with the will to act, to assume risks to bring about change through the organisation of human efforts.

Hawley (1882) saw risk taking as the distinguishing attribute of the entrepreneur, and ranked this as a factor in production on par with land, labour and capital. Similarly, Heredero (1979) described

agricultural entrepreneur as a person who introduces changes which directly or indirectly lead to higher agricultural output.

Minzberg (1976) stated that entrepreneurial behaviour is characterized by active search, expansionist outlook and decision taking. Further, Leeds and Stainton (1978) defined entrepreneur as a person who initiate production, takes decision, bears risks, involves, organise and coordinates the other factors.

Commonly-assumed previous definitions of an entrepreneur as someone who finds a new venture or who owns a business is too restrictive (Alison and Shailender, 1994). Where as, entrepreneurship as the purposeful activity (including an integrated sequence of decisions) of an individual or group of associated individuals (Cole, 1959).

Gopakumar (1995) explained entrepreneurship being myopically by social scientists. It is, has always have been closely aligned with the quality of leadership. However, Hoslitz, (1957) opined that Entrepreneurship is a more evasive thing. It is not so much a particular set of institutions through which it is brought to bear, but its presence or absence, its vigour or debility depends upon a whole series of environmental conditions and appropriate personal motivation.

Forster (1953) while describing farming as a business, identified farmer is an entrepreneur and that he should apply business principles to the organisation and management of the farm,

if he expects to utilize his resources to the best advantage. Whereas Joshi and Kapur (1973) described farm entrepreneur as a person (can be a group of persons also) who thinks of organises, and operates the business, and is responsible for the results i.e., losses and gains from the business. He is pioneer in organizing and developing the farm, firm.

What can public policy do to create an environment conducive to entrepreneurship ? What if any, should be the extent, and nature of governmental intervention in the economic sphere to achieve this purpose? These questions have been a subject of long debate (Leo paul dana, 1993).

Entrepreneurship Development Model for 21st century explains Entrepreneurs are those who (1) Learn and listen (2) Take risk and responsibility (3) Know their own uniqueness and hence are innovative, creative in their own way. (4) Are free from fear of failure or success. (5) Always add value to what they produce (6) Above all, are always achieving (Ranade, 1996).

2.2.2 Entrepreneurship factors

Entrepreneurship is too complex a phenomenon to be explained by any single set of factors. While defining entrepreneurship, one is often reminded of the story of the four blind men describing an elephant. Psychologists, sociologists, anthropologists, economists and researchers from different

disciplines have tried to explain and describe this complex process. Some researchers have classified these into six different schools of thought namely the 'great person', the psychological characteristics, the classical, the management, the leadership and the entrepreneurship school. According to them, each school of thought with its own underlying set of beliefs focusses on one particular aspects of entrepreneurship. Thus while researchers with psychological characteristics as focus would discuss factors such as the need for achievement and risk taking capability of an individual, those with entrepreneurship focus would get involved in knowing how entrepreneurial persons work in complex organisations. While there could be divergent views or models of entrepreneurship, there seems to be unanimity as far as the entrepreneurial function or entrepreneurial process is involved. Different authors have put it under different captions (Ajit kanitkar, 1994).

For a long time, research in entrepreneurship remained centered around individual personalities. With the emergence of large corporation, contributing to the growth of wealth and employment, interest in the organisational characteristics linked with high growth had increased, resulting in a diversity of approaches ; many of which are in conflict with each other (Alison and Shailender, 1994).

Entrepreneurs have their own life-styles. They are highly active, obsessed with their own ideas and the need to succeed, and are impatient, using all possible means to achieve their goals. They are

generally individualistic, working alone, ruthlessly and unsparingly. While the entrepreneurs have been found to have several common characteristics, different types of entrepreneurs may have different characteristics. For example , rural entrepreneurs are more likely to be community oriented (Udai pareek and Rao, 1995).

According to Selvanayakam (1998) creativity is the process by which novel ideas are generated. Creativity is thought by many to be 'inspired' its coming and going unpredictable and highly idiosyncratic. The basic assumption is that entrepreneurship and creativity cannot be studied exclusively from one frame of reference such as the person or organisation, but must be dealt with more holistically. In otherwords, understanding creativity provides a foundation for modules on entrepreneurship. Central to the entrepreneur's role is the constant desire to create something new.

According to Ranade (1996) the entrepreneurship development programme models in the forthcoming period will have to focus on the key role of entrepreneurs and they are (1) to initiate (2) to establish (3) to build (4) to develop (5) to manage (6) to supply goods and services (7) to specialize in their own strength (8) to a focused clientele in open to competition market place.

An entrepreneur has several psychological needs or motives. The most significant need is achievement need. This is shown in an entrepreneur's concern for excellence, efficiency (high input-output raito) and quick results. The next need in order of importance is that

of power, i.e., the concern for making an impact, controlling people and resources. The third need, less important for the earlier phases of entrepreneurial but significant for the expansion of entrepreneurship on to a larger scale, is that of extension, i.e., the concern for others, the need to serve people and be of use and help to larger groups. The last need, much less significant and in some ways not directly related with entrepreneurship, is the affiliation need, the concern related people, to be close to others. Various entrepreneurial role stresses around these four needs (Udai pareek, 1994).

According to Akhouri (1979) very often extension workers, planners and researchers express concern about the factors affecting entrepreneurial success without spelling out the actual meaning of the term "Entrepreneurial success". They have identified in greater detail, the economic insight, managerial efficiency and personality variable required for performing entrepreneurial task, yet very little efforts has been made to combine them together to evolve a composite method of measuring the success of entrepreneurs. A review of researches show that the social scientists are in agreement about the four basic features (1) an entrepreneur takes moderate risk to venture a new pursuit. (2) he has the insight to sense and the capacity to mobilise the resources of the environment to attain his goal. (3) he has the managerial efficiency to generate profit from the enterprise and (4) he constantly strives for progress and further growth.

McClelland (1961) reported in his 'Achieving society' that entrepreneurs are characterised by (1) Unusual creativeness (2) Propensity of risk taking and (3) strong need for achievement. He proved that high-n-ach is associated with entrepreneurship. Accordingly, the associates of McClelland reported the following characteristics of a person with high n-Ach. (1) Likes to take personal responsibility (2) Likes to take moderate risks (3) Wants to know the results of his efforts (4) Tends to persist in the face of adversity. (5) Tends to be innovative (6) Is oriented towards the future (7) Tends to be mobile, and is not completely content.

Tandon (1975) based on a case study of an entrepreneur who initiated a cold storage of a private concern in a developing region observed the characteristics of such entrepreneur (a) Educated social background, with degrees (b) Person who provides technological guidance to others in his field (c) Makes efforts towards continuous expansion of scale of operation by ploughing back the resources (d) Conscious of the need of diversifying resources (e) Innovative and imitative and (f) Conscious of role and social responsibility.

Singh (1969) described four important functions of entrepreneurs Viz ; (1) Motivation for achievement (2) Skill required for productive purposes (3) Ability to make decision (4) Desire to introduce improvement in techniques of production.

A study by the behaviour Science Centre identified seven important qualities of entrepreneurs and they are as follows :

- (1) The need to achieve : The motivation to achieve has been identified as an important input in entrepreneurial behaviour.
- (2) Risk taking : They are found to have an inclination to take calculated, moderate, intelligent risk. They tend to avoid both excessively high and low risk situation.
- (3) Positive self-concept : Includes self-confidence and self-efficacy as also the positive image of one's own abilities and achievement.
- (4) Initiative and independence : Such people not only show initiative but also independence in their day to day behaviour. They like to act on their own rather than follow directions.
- (5) Problem solving : They have tendency to approach problems in order to solve them.
- (6) Hopeful about future : Such people tend to look at future with hope. They may have dissatisfaction with their present working conditions but they hope to have reasonable bright future.
- (7) Searching environment and time bound planning : Such people are not given to take things for granted. Instead they tend to search. (Anonymous1971)

Redlich (1949) made a tripartite division of the entrepreneurial into capitalist i.e., supplier of funds and non-human resources for the enterprise, manager i.e., supervisor and coordinator of productive activities, and entrepreneur in the narrow sense of the term i.e., planner, innovator and ultimately decision maker in a productive enterprise.

Marshall (1949) stated that the entrepreneurs are the men who in business of modern world adventure or undertake risks, bring together the capital and the labour required for the world, arrange or engineer its general plan, and superintendent its minor details. Further, Hoselitz (1951) pointed out that some writers have identified entrepreneurship with the function of uncertainty bearing, others with the co-ordination of productive resources, some others with the introduction of innovations and skills, while many others with the provision of capital.

Hirschman (1959) considered the innovating entrepreneur primarily as a strong individualist. His leadership, his willingness to assume the risk, his breaking through old patterns of finance, production and distribution were emphasized and almost made him look like rebel against society. Similarly, according to Tandon (1975) the entrepreneurs must possess the following important qualities : (a) capacity to assume risk and possessing self confidence (b) technological knowledge, alertness to new opportunities, willingness to accept change and ability to imitate, (c) ability to marshall resources and (d) ability of organisation and administration.

Minzberg (1976) pointed out that the entrepreneurial behaviour is characterised by active research, expansionist outlook, and decision making. Whereas, Collins and Moore (1964) concluded that entrepreneurs can be best described as too restless, too independent, and too creative.

According to Ramakrishna (1979), the characteristics of entrepreneurs are : (a) level of motivation, (b) Managerial competence, (c) self confidence, (d) leadership qualities (e) risk taking ability and (f) Independence in thought and action.

Berna (1970) while studying the entrepreneurs' in Madras state revealed the qualities of 'good entrepreneurs' viz., (a) entrepreneurs' are energetic, enterprising, resourceful, alert to new opportunities, able to adjust new conditions and willing to assume risks involved in change (b) They are interested in expanding the business and reinvest earnings in the business and (c) They are technically advanced.

McClelland and Winter (1969) while studying the participants in achievement motivation courses, reported that the participants were more active, worked longer hours, made some definite attempts to start new business and made more specific investment in productive capital. Further, they stated that because of all the basic aspect of the entrepreneurial qualities, participants became improved entrepreneurs.

People with higher levels of motivation work harder, learn faster and are more self reliant. They have an activists outlook on life that encourage them to try and manipulate the environment to suit their own needs. They have high aspirations and are very mobile when considering economic opportunities. These people are oriented towards saving and investing for the future. They are likely to be

entrepreneurs, risk takers and innovators, with desire to excel personal accomplishment (Sharma, 1970).

Hornaday and Abond (1971) analysed a number of characteristics which were significantly associated with entrepreneurs. Out of the nine characteristics i.e., (1) n-Ach, (2) Autonomy, (3) Aggression, (4) Support, (5) Conformity, (6) Recognition, (7) Independence, (8) Benevolence and (9) Leadership, they found the need for achievement, support, independence and leadership as the most significant characteristics.

Uplankar (1977) in a study of self employed industrial entrepreneurs found that majority of the respondents were quite young, educated upto matriculation and one third had technical education. Further, he indicated that exposure to new ideas, higher education and incentives were the chief characteristics of the business communities.

The confidence, perseverance, determination, hard work, general knowledge, dynamism, risk taking, optimum technical knowledge, information gathering ability, and initiative are some of the important characteristics which differentiate entrepreneurs from non- entrepreneurs (Rao and Moulik, 1979).

According to Low and MacMillan (1988) much entrepreneurship research to date has implicit assumed a 'strategic adaptation' perspective. This presumes that entrepreneurs make decision by consciously identifying opportunities and devising

strategies to realise these opportunities. It assumes that the entrepreneurial individual is goal driven, and that there are identifiable factors which contribute to the success or otherwise of a venture. This search for predictive factors of success is probably one of the main reasons why much of entrepreneurship research has concentrated on the personality characteristics of the successful entrepreneur.

Adaptation of technology is a vital component of any successful economy generating activity. This is especially so because the ultimate goal of technological change is not merely economic growth but overall development of an economic agent. Entrepreneurial traits such as desire to achieve, risk taking, problem solving, environment probing and positive self image may contribute to the adoption of appropriate technology. Conversely, the absence of these entrepreneurial properties may hinder the process of technological change, whatever the level of infrastructure or institutional facilities. In an increasingly competitive environment even the growth of crop production depends largely on technological change. It is, therefore meaningful to assume that entrepreneurship can be manifested in the agricultural sector too (Anand Singh and Krishna, 1994).

The environmental factors which powerfully condition the range and scope of entrepreneurial activity. Among these government, laws, regulations and procedures are important. Government policy, in turn reflects attitude which can be defined as general orientation,

a state of readiness, exerting a directive or dynamic influence and the attitude of the government (Leo paul dana, 1993).

In a heterogeneous and stratified society like India, it is not adequately realised that the factors which distinguish entrepreneurship may not be uniform for its different strata, what could be entrepreneurial activity in a particular section of the population may not be considered so in other sections (Narayana Swamy, 1996).

If we in the field of entrepreneurship want to do anything more than profit from a fad, we must approach entrepreneurship development and our activities as if we were developing a new science. We must continually strive to understand better entrepreneurial reality through a variety of empirical research methods (Dennis, 1993).

2.2.3 Entrepreneurship of farmers

The development of any nation depends primarily on the important role played by entrepreneurs. Hence, the part played by entrepreneurs is of vital importance in a developing country like India, where there are ample opportunities for using sustainable agriculture innovations to exploit the available resources. Thus in all economic development activities more attention is being given to entrepreneurship development.

The term entrepreneur is normally perceived as referring to those engaged in industrial activity. Farmers are seldom regarded as entrepreneurs. It can be argued, however, that with agriculture increasingly assuming the character of business, the success or failure of a farming operation, depends on how creatively the operators respond to the challenge of emerging opportunities. Thus, even in farming activity the traits and characteristics normally associated with entrepreneurs may play a decisive role. An appreciation of this phenomenon may expand the conceptual understanding of entrepreneurship and help formulate realistic agricultural policies (Anand Singh and Krishna, 1994).

Entrepreneurship is highly complex and is subjected to prevailing socio-economic specificities. Therefore, one cannot have a set of universal and finite factors that can be applied everywhere, on the other hand, motivating factors, personality attributes and functions of entrepreneurs would vary depending on several other variables (Chandra poojary, 1997).

According to Porchezian *et al.* (1998), the entrepreneurial behaviour consists of factors like innovation proneness, decision making, achievement motivation, assistance of management services. Risk taking ability, level of aspiration and locus of control.

There are a number of Indian studies on the risk taking propensity of entrepreneurs. Singh (1970) found progressive agricultural entrepreneurs to be moderate risk takers whereas

traditional agricultural entrepreneurs exhibited extreme risk taking tendencies. Singh and Singh (1971) studied the risk taking propensity of business and agricultural entrepreneurs in Delhi and found business entrepreneurs are more risk taking than agriculture entrepreneurs. The risk taking propensity of slow progressing and fast progressing entrepreneurs of Punjab found high risk taking associated with slow progressing entrepreneurs (Sundar and Kamalanabhan, 1997).

Entrepreneurial skill flexes ability to get things done correctly manipulating inputs like labour, material, money, machines and time and thus maximise output for a given amount of duct. Thus, who gets things accomplished in a systematic way is a successful one (Waghdhare and Wakde, 1989).

The entrepreneur, plays an important role in the economic development of a country and entrepreneurial competence makes all the difference in the rate of economic growth. He is the key person who envisages new opportunity, new techniques, new lines or production, new products and co-ordinates all other activities. Basically, an entrepreneur is a person who is responsible for setting up an enterprise. In fact, he is one who has the initiative skill for innovation and who looks for high achievements (Patel, 1995).

Grunig (1970) while studying communication and economic decision making process of Colombian peasants indicated that problem solving, economic rationality as a decision criterion,

adoption and achievement motivation were high. This group was well educated and literate, their income was high, information seeking was high, as well as exposure to authoritative sources, credit supervision and news papers reading habit were high.

Epstein (1967) identified the following characteristics of entrepreneur farmers viz., (1) High education (2) Contacts with various people (3) Innovator (4) Enterprising cultivator, who adopted improved practices in farming.

Sinha and Mehta (1972) indicated that farmers with medium size of land holdings show greater motivation to achieve, and readiness to change, compared to both small and bigger land holders and the younger ones are better disposed to achieve change, irrespective of the size of their land holding.

Hundal and Singh (1978) while studying some correlates of progressive farm behaviour, indicated that n-Ach was particularly associated with farm success. Other characteristics linked with success were intelligence, aspiration to advance, need for power, tender minded, temperament, and radical outlook. All these factors except need for power are within the wider concept of achievement motivation.

Singh (1978) showed that high scores on attitude toward farming, preference for activity, pride in work, upward striving, cautions, decision making were associated with progressive farm behaviour, low scores on these variables were associated with static

or declining farm success. Kilby (1971) indicated that one of the integral part of entrepreneurial behaviour is introduction of new product and technology.

Education, socio economic status and annual income were found to be significantly related to technology adoption level of a sample of 90 vegetable growers in Nagpur district of Maharashtra, India. Vegetable growers who were more scientifically oriented with a higher degree of risk preference were found to have higher adoption level of the package of vegetable growing practices (Deotale *et al.* , 1994).

Porchezian *et al.* (1998), entrepreneur is the central figure of economic activity and prime mover of development. They are persons who initiate, organise, manage and control the affairs of an enterprise that combine the factors of production to supply goods and services in any sector. The development or underdevelopment of a country depends on the entrepreneurial skills, therefore to be regarded as the most needed component for the development.

Venkataramaiah (1993) indicated that participant small farmers of integrated rural development programme had significantly higher entrepreneurial behaviour than non-participant small farmers in different agricultural programmes.

A study by the University of Agricultural Sciences, Bangalore on entrepreneurial behaviour of small farmers has revealed that irrespective of age, small farmers with entrepreneurial behaviour had

high success in their enterprises, strengthened subsidiary occupation, high cropping intensity, adopted recommended technologies, high income in their farming, high extension participation, high social participation and repaid the loans regularly. Eventhough the author stated that the adoption of innovations mainly depends on the entrepreneur characteristics like innovativeness, decision making ability, achievement motivation, information seeking ability, risk taking ability co-ordinating ability, leadership ability, cosmopoliteness, knowledge of farming and assistance of management services. He identified five most important components of entrepreneurial behaviour of small farmers among the ten components. They are (1) Decision making (2) Innovativeness (3) Assistance of management services (4) Achievement motivation (5) Ability to coordinate farm activities (Nandapurkar, 1980)

It was found that successful entrepreneurs rated significantly higher in innovativeness, achievement motivation, knowledge, information seeking behaviour, risk taking propensity, co-ordinating ability, assistance of management services, leadership and cosmopoliteness, than those who had failed or did not start farming. Degree of success, however, was not dependent on the Decision making behaviour of the entrepreneurs (Nasser Ahmed and Kakoty, 1993).

Wharton (1966) reported that subsistence farmers respond as quickly to economic stimuli, "as the most commercial farmers in the

modern world". And it is precisely those with high achievement who are responsive to economic stimuli and who find ways of making a better living at farming from adopting new practices.

According to Sethy *et al.* (1984) entrepreneurial characteristics of farmers in adoption of an improved farm technology were personal efficiency, risk taking behaviour, feed back, owning responsibility, psychological modernity. Achievement motivation, knowledge of the technology and farm educational exposure. Some of the socio-economic psychological and personal characteristics of man engaged in farming have quite extensively been explored in relation to their contribution to farm development, but the entrepreneurial qualities of those engaged in farming are relatively unexplored.

A question may be raised at this juncture as to why the extension approach is required to be incorporated in an entrepreneurship development activities at all. In other words, if the entrepreneur is supposed to be a person with certain characteristics like higher need for achievement, high initiative, greater locus of control (McClelland, 1969). What is the need for designing a support system to encourage and to motivate him ? Before answering this question, it would be appropriate to briefly review the factors that are involved in entrepreneurship as a process. It would enable us to take a better perspective of the extension approach that is being discussed in the context of entrepreneurship development (Ajit kanitkar, 1994).

The entrepreneur development programme models will therefore have to be more dynamic, flexible, market research based and individually adequate rather than being common behavioural science and procedural formalities uniformity based. These models will have to be developed as a research exercise by the institution of entrepreneurship development and their efficiency measured against a preagreed bench mark. Due to a large number of different economic strata, social strata, infrastructural strata existing in the country the models suitable for a variety of combinations of situations, will be in large numbers and varying. It would also be worth examining to see if entrepreneurship development programmes are in practices in other nations, particularly in China, Korea and Taiwan (Ranade, 1996).

MATERIAL AND METHODS

CHAPTER III

MATERIALS AND METHODS

The research materials and methods used in conducting this study have been presented under the following headings :

- 3.1 Methods used to identify and standardize sustainable agricultural practices.
- 3.2 Locale , population and sample for the study
- 3.3 Independent variables used in the study
- 3.4 Dependent variables for the study
- 3.5 Intervening variables of the study
- 3.6 Development of interview schedule and collection of data
- 3.7 Statistical methods and tests used in the study.

3.1 METHODS USED TO IDENTIFY AND STANDARDIZE SUSTAINABLE AGRICULTURAL PRACTICES

Concerted attempt to standardize sustainable agricultural practices in any study has not been reported even though more emphasis has been given to sustainable agriculture by several organisations in the country. The government as well as non-governmental organisations started promoting sustainable agricultural practices among farmers. Thus, it was necessary to develop and standardize sustainable agricultural practices which could provide more objective way of sustainable agricultural

development in the country. Keeping this in view, sustainable agricultural practices were standardized. The steps indicated below were followed in the process of standardization.

3.1.1 Item collection :

Relevant literature was reviewed for getting insight to standardize practices. Based on this a list of sustainable agricultural practices which consisted of nine broad items with sub items under each main item (total of 74 sub items) were prepared. This list was given to a team of expert judges for their opinion to standardize the practices.

3.1.2 Selection of judges :

A total number of 52 Judges who were experts/ Knowledgeable persons in the area of sustainable agriculture were randomly selected among 150 people from the 3rd International Federation of Organic Agriculture Movements - ASIA (IFOAM-ASIA) Scientific International conference "Food security in Harmony with nature" held at the University of Agricultural Sciences, Bangalore, December 1-4, 1997. These Judges belonging to the following categories.

- a) Authors who have written books/published research papers/ attended seminars, conferences, symposia etc. on sustainable agriculture.

- b) Knowledgeable persons working in the field of sustainable agriculture / Agricultural extension / Educational institutions/ Governmental organisation.
- c) Project personnel and field workers at the micro level who have responsibility to promote sustainable agricultural development programmes.
- d) Voluntary organisations/Agencies (NGO's) who have implemented sustainable agricultural programmes.

3.1.3 Obtaining opinion of the Judges

The Judges were requested to give their opinion regarding suitability of the broad items and sub items for standardization. They were also requested to use three point rating scale as suggested by Guilford (1954), which consisted of most relevant to not relevant (enclosed in Appendix I) Scoring used for the responses were as follows:

<u>Response</u>	<u>score</u>
Most relevant	2
Relevant	1
Not relevant	0

3.1.4 Selection of items

The responses received from the experts were subjected to analysis of relevancy coefficient of i^{th} component (R_i) by using the following formula suggested by Guilford (1954).

$$RC_i = \frac{\text{Total score of all the judges on } i^{\text{th}} \text{ component}}{\text{Maximum score on the continuum} \times \text{Total number of judges}}$$

Seven broad items and sub items under each broad item which passed the Relevancy coefficient of > 0.7 were selected and presented in (Table III & IV).

3.2 LOCALE, POPULATION AND SAMPLE FOR THE STUDY

3.2.1 Locale of the study:

The study was conducted in Bangalore, Karnataka State, India during 1997-98. The study was aimed at entrepreneurial behaviour of farmers practicing sustainable agriculture. Therefore, the study was purposively taken up in the 3rd IFOAM-ASIA Scientific International Conference “Food security in harmony with nature” held at University of Agricultural Sciences, Bangalore, Dec. 1-4, 1997.

3.2.2 Population

Population for the study consisted of 250 farmers who attended 3rd IFOAM-ASIA Scientific conference “Food security in harmony with nature” from ten different states of the country.

3.2.3 Sample

The list of 250 farmers who attended the 3rd IFOAM-ASIA scientific conference on “Food security in harmony with nature” were collected among them 60 farmers who adopted sustainable

agriculture in different parts of the country were selected randomly. The details of respondent farmers is presented in Table I.

3.3 METHODS USED FOR MEASURING INDEPENDENT VARIABLES

3.3.1 Age

Age of the respondents was measured as revealed by the respondents in the form of number of completed years as on 1-1-1997. The categorisation of farmers was made as suggested by Dwarakinath (1973).

Age category	No. of completed years
Young	upto 35 years
Middle	> 35 upto 55 years
Old	56 years and above

3.3.2 Education

Education is the amount of formal schooling of a farmer. It was measured in years of schooling completed by a respondent farmer as recommended by UNESCO (Roy and Iyer, 1967) has been followed in the study with slight modifications. The categorization is as follows :

Educational group	No. of years of schooling
Illiterate	0
Primary	1-4
Middle	5-7
High school	8-10
College	> 10

3.3.3 Family size

Respondents were grouped into two categories namely small and big based on the total number of members in the family as suggested by Trivedi (1963) :

Category		Number of members
Small family	=	Below five members
Big family	=	5 and above members

3.3.4 Size of land holdings

Respondents were grouped into two categories as per their size of land holdings as suggested by Narayana Swamy (1995).

Category	Size
Small farmers	Upto 5 acres
Big farmers	More than 5 acres

3.3.5 Mass media participation

It refers to the extent to which a respondent farmer is exposed to different media such as farm radio, Television and news paper. The procedure suggested by Trivedi (1963) was followed with slight modifications. Respondents were grouped into three categories :

Category name

1. Listening to farm radio
2. Listening and viewing farm information in T.V.
3. Reading farm information printed material

3.3.6 Organizational participation

Respondents were grouped into three categories based on their membership in local organisations.

Category	Membership in organisations
High	Member in more than 3 organizations
Medium	Member in 2-3 organizations
Low	Member in 0-1 organization

3.3.7 Extension participation

Extent of involvement of respondent farmers in the extension educational activities refers to extension participation. As suggested by Muniraju (1976) the respondents were categorised into three groups viz., low extension participation, medium extension participation and high extension participation.

Category	Extension activities
Low extension participation	0-1
Medium extension participation	2-3
High extension participation	> 3

3.4 DEPENDENT VARIABLES FOR THE STUDY

In the present study sustainable agriculture has been taken as Dependent variable, and measured through adoption of sustainable agricultural practices. The seven standardized broad items of

sustainable agricultural practices were used for measurement of dependent variable.

3.5 INTERVENING VARIABLES OF THE STUDY

Entrepreneurial behaviour taken as the intervening variable for the study, measured through factors like innovativeness, Decision making ability, Achievement motivation, Information seeking ability, Risk taking ability, Co-ordinating ability and Leadership ability

3.5.1 Innovativeness

The innovativeness was considered as socio psychological orientation of individual closely associated with change, adopting new ideas and practices. It is defined as the degree to which an individual adopts new ideas relatively earlier than others in his social system (Rogers and Svenning, 1969).

The scale developed by Nandapurkar (1980) was used to measure innovativeness with slight modification. This component consisted of five new ideas which were common to all the farmers included in the sample. If farmer would have adopted the new idea in 1987 he would get 6 points one for two years. If he would have adopted the practices in 1989 he would get five points. Like wise for each new idea each respondents innovativeness score was calculated. The score thus obtained was converted out of ten, since all sub-components have to be allotted the same score of ten (Appendix V).

3.5.2 Decision making ability

Farmers have to take decisions at various stages of sustainable farming enterprise. Decision making pattern was considered as the nature of decision making either individually or consulting with others while performing sustainable agricultural activities. It is the degree to which an individual justifies his selection of most efficient means from among the available alternatives on the basis of scientific criteria for achieving, maximum economic profits.

In the present study the scale developed by Singh (1978) was used with slight modifications. Ten items relevant to this study were used to measure the decision making capacity of the respondent. Response categories for each item were, 'not considered', 'considered after consultation with others', and 'decision taken independently', the alternatives were scored from 0, 1 and 2 in the order given, and total score was computed for each respondent by summing the scores. The maximum score was converted for out of ten since all sub-components have to be allowed the same score of ten (Appendix V).

3.5.3 Achievement motivation

Every man has a desire to achieve some things in his life. Achievement motivation was considered as the extent to which a farmer is oriented towards maximization of profits. McClelland (1961) defined achievement motivation as a social value that emphasises a

desire for excellence in order for an individual to attain a sense of personal accomplishment.

In the present study, sentence completion test developed by Morrison (1962) was used with slight modification. The various categories for scoring, Unrelated Imagery (UI), Task Imagery (TI), Achievement Performance (A-PI) and Need (N), were weighted on 0, 1, 2 and 3, respectively. Each item was classified as UI, TI, A-PI and/or N, according to the most heavily weighted (maximum) category farmer. Thus obtained maximum score was converted for out of ten since all sub-components have to be allotted the same score of ten (Appendix V).

3.5.4 Information seeking ability

It refers to the degree of frequency of contact by an individual with various information sources. This is the pattern by which a farmer gets his information either on his own seeking or as a consequences of his being a part of a network. Lerner (1964), Dwarkinath (1973) and Nandapurkar (1980) measured this variable by putting simple questions.

In the present study, the degree of frequency of contact with information sources of respondent was measured on three points response, category, namely 'Never', 'Less frequently' and 'More frequently'. For each of the information source consulted by a respondent, a score of 0, 1 and 2 was assigned respectively. The total

score was computed for each respondent by summing the score recorded. The maximum score was then converted for out of ten (Appendix V).

3.5.5 Risk taking ability

Some farmers take more risk, some other take moderate risk and more hesitate to take risk because sustainable farming is a risky business. Risk taking ability was considered as the degree to which farmer orientation towards risk and uncertainty in adopting new ideas in sustainable farming and courage to face the problems in farming. Dwarkinath (1973) ; Nandapurkar (1980) has measured this variable on four point rating scale.

In the present study, risk taking ability of respondents was measured by using rating scale which consisted of six questions. Each item was scored by giving one point if the respondent has taken the risk and 0, score for not taking the risk. Summation of total score would be his total risk taking ability score. Maximum score on this scale was converted to ten (Appendix V).

3.5.6 Co-ordinating ability

In order to complete the required work in stipulated period, farmer has to harmonize and synchronize the various farm activities for better farming business. It is defined as the degree to which an individual co-ordinates action in a time dimension. Nandapurkar

(1980), Eswarappa (1991) has measured this variable by providing alternate responses under each scale item.

In the present study, co-ordinating ability was measured providing alternative responses under each item. It was measured along a three point rating scale. The maximum score on this scale was 10 (Appendix V).

3.5.7 Leadership ability

To get things done properly, farmer has to initiate the action, motivate the followers and decision should be taken. It is the degree to which an individual initiates or motivates the action of the other fellows. Nandapurkar (1980), Nasser Ahmed and Kakoty (1993) has measured this variable using three point rating scale.

In the present study, this variable was measured along a three point rating scale - 'always', 'some time' and 'never' with decreasing score from 2, 1 and 0 and the maximum score on this scale was 10 (Appendix V).

3.6 DEVELOPMENT OF INTERVIEW SCHEDULE AND COLLECTION OF DATA

The interview schedule was prepared taking into consideration the objectives of the study. The available literature and experts in the field of sustainable agriculture, agricultural extension and related fields were consulted. A well structured interview schedule was developed. The schedule was pre-tested with a sample of 30 farmers

in a non sample area to find out any ambiguity and redundancy. In the light of pre-test experience the interview schedule was modified and used. Data were collected from the respondent farmers by personal interview method. The interview was conducted during December 1997. The 3rd IFOAM-ASIA International Scientific Conference “Food Security in Harmony with Nature” was used for collection of data. Each question was made clear during the personal interview and it was conducted in formal atmosphere. Equal emphasis was given in explaining the questions to all the respondents.

3.7 STATISTICAL METHODS AND TESTS USED IN THE STUDY

The main statistical methods used for the purpose of tabulation and analysis of data were Percentage, Chisquare test, Analysis of variance, Correlation coefficient and Relevancy coefficient.

1. Chisquare test

The Chi square test was used to find out the association between Independent and dependent variables. The Chisquare test was conducted as recommended by Guilford (1956).

2. Analysis of Variance

One way analysis of variance test was conducted to find out the relationship between independent variables and intervening variables as recommended by Ferguson (1966).

3. Correlation coefficient

The Correlation coefficient was used to measure the extent of relationship between dependent variables and intervening variables as suggested by Garret and Wood worth (1967)

4. Relevancy coefficient

The relevancy coefficient was used to standardize sustainable agriculture practices as suggested by Guilford (1954)

RESULTS

CHAPTER IV

RESULTS

The results of the study have been reported under the following headings :

- 4.1 Identification and Standardization of sustainable agricultural practices.
- 4.2 Socio-economic characteristics of farmers practicing sustainable agriculture.
- 4.3 Entrepreneurial behaviour of farmers practicing sustainable agriculture.
- 4.4 Sustainable agricultural practices adopted and different type of crops grown by farmers.
- 4.5 Irrigation facility and animals owned by the farmers practicing sustainable agriculture.
- 4.6 Constraints faced by farmers in adoption of sustainable agriculture.
- 4.7 Sustainable agricultural practices adopted by farmers and their socio-economic characteristics.
- 4.8 Entrepreneurial behaviour of farmers and their socio-economic characteristics.
- 4.9 Relationship between judges opinion and adoption of sustainable agricultural practices by farmers and their entrepreneurial behaviour.
- 4.10 Recommendations for adoption of sustainable agriculture by farmers in the country.

4.1 IDENTIFICATION AND STANDARDIZATION OF SUSTAINABLE AGRICULTURAL PRACTICES

58

Based on literature reviewed nine broad items and sub items under each broad item (a total of 74) were selected as possible sustainable practices for sustainable agriculture. (Appendix I).

This list was given to 52 judges from 18 countries of the world who attended 3rd IFOAM-ASIA Scientific International Conference "Food Security in Harmony with Nature" held at the University of Agricultural Science, Bangalore, December 1-4, 1997. These judges were requested to indicate the relevancy of each item on the three point rating scale ranging from most relevant to not relevant to know the suitability of the items for standardization. The responses were received and a list giving details of judges responded had been presented in Table II.

Fifty two judges belonging to different categories returned the questionnaire. Looking to their judgement a list of broad categories and detailed items under each head were finalized. Based on the scores given by the judges the seven broad items and sub items under each broad item were selected.

The responses received from the judges were subjected to analysis of relevancy co-efficient of i^{th} component (R_i) by using the following formula suggested by Guilford (1954).

$$RC_i = \frac{\text{Total score of all the judges on } i^{\text{th}} \text{ component}}{\text{Max. score on the continuum} \times \text{Total number of judges}}$$

Table I

**Details of respondent farmers belonging to different states
of the country**

(N = 60)

Sl. No.	State	Number of farmers responded	Percentage to total number of farmers responded
1	Andhra pradesh	9	15.00
2	Gujarat	5	8.33
3	Karnataka	10	16.67
4	Kerala	7	11.67
5	Maharastra	11	18.33
6	Tamil Nadu	8	13.33
7	Uttar pradesh	10	16.67
Total		60	100.00

Table II**Details of responses received from judges belonging to different countries of the world**

(N =52)

Sl. No.	Country	Number of Judges responded	Percentage to total number of judges responded
1.	Bangladesh	2	3.85
2.	China	3	5.77
3.	France	1	1.92
4.	Germany	1	1.92
5.	Hong Kong	1	1.92
6.	India	9	17.30
7.	Indonesia	2	3.85
8.	Japan	7	13.47
9.	Korea	3	5.77
10.	Malaysia	3	5.77
11.	Mauritius	1	1.92
12.	Nepal	2	3.85
13.	Netherlands	1	1.92
14.	Pakistan	2	3.85
15.	Philippines	6	11.53
16.	Singapore	1	1.92
17.	Sri Lanka	4	7.70
18.	Thailand	3	5.77
Total		52	100.00

Further, Guilford (1954), Relevancy coefficient of 0.7 was taken as the minimum value to consider the relevancy of broad and sub items for subsequent analysis. Seven broad items passed the above criteria and also sub items under each main item passed with the relevancy co-efficient of above 0.7 were selected and presented along with their relevancy co-efficient in Table III & IV.

4. 2 SOCIO -ECONOMIC CHARACTERISTICS OF FARMERS WHO ADOPTED SUSTAINABLE AGRICULTURE

4.2.1 Age

Table V gives the age grouping of farmers practicing sustainable agriculture. It is observed from the table that farmers practicing sustainable agriculture were belonging to all the age groups. However, more than half (53.34 per cent) of the farmers belonged to middle age group. The percentage of young and old age groups were similar (23.33 per cent).

4.2.2 Educational level

The educational level of farmers practicing sustainable agriculture has been presented in Table VI. The data presented in the Table indicates that all the farmers starting from primary school to college level were involved in the adoption of sustainable agriculture. However, majority (63.34 per cent) of the farmers had an education up to college level. Further, the primary, middle and high

Table III**Broad items of standardized sustainable agricultural practices**

(N = 52)

Sl No	Sustainable practice	Relevancy coefficient
1.	Organic Farming	0.95
2.	Intergrated Farming	0.93
3.	Integrated Pest Management	0.88
4.	Integrated Nutrient Management	0.86
5.	Agro-forestry	0.84
6.	Soil and Water conservation	0.82
7.	Bio-fertilizer use	0.80

Sub items of standardized sustainable agricultural practices

(N = 52)

Sl. No.	Sub - sustainable practices	Relevancy coefficient
I Organic Farming		
1.	Following crop rotation	0.94
2.	Using crop residues	0.91
3.	Using animal manures	0.90
4.	Growing leguminous crops	0.89
5.	Using green manures	0.87
6.	Using off farm organic wastes	0.83
7.	Using mineral bearing rocks	0.82
8.	Biological control	0.81
II Integrated Farming		
1.	Growing crops and maintaining animals	0.94
2.	Animal power for cultivation	0.92
3.	Growing trees and animals	0.90
4.	Silk worm and dairy animals	0.88
5.	Fish culture in paddy fields	0.86
6.	Duck farming in paddy fields	0.81
7.	Poultry and fish farming	0.78
8.	Piggery and fish farming	0.75
III Integrated Pest Management		
1.	Using cultural methods	0.93
2.	Using biological methods	0.92
3.	Using mechanical methods	0.91
4.	Using physical methods	0.90
5.	Using chemical methods	0.89
6.	Using genetic methods	0.85
7.	Using regulatory methods	0.82

Table IV Contd..

(N = 52)

Sl. No.	Sub- sustainable practice	Relevancy coefficient
IV Integrated Nutrient Management		
1.	Using organic manure	0.95
2.	Using mineral bearing rocks	0.93
3.	Using animal manures	0.91
4.	Using off farm wastes	0.87
5.	Using crop residues	0.85
6.	Hand weeding	0.82
7.	Intercropping system	0.80
8.	Using chemical fertilizers	0.79
V Agro-forestry		
1.	Growing crops, trees and animals in temporal sequence	0.93
2.	Growing trees on bunds	0.91
3.	Growing trees and crops as multiple cropping	0.90
4.	Growing trees and crops as intercropping	0.83
5.	Multistoried agro-forestry	0.81
6.	Alley cropping system	0.76
VI Soil and Water conservation		
1.	In-situ moisture conservation	0.95
2.	Off season and early tillage	0.93
3.	Contour bunding	0.90
4.	Nala bunding	0.89
5.	Crescent bunding	0.86
6.	Catch pits	0.81
7.	Check dam	0.80
8.	Surface farm ponds	0.79
VII Bio-fertilizer use		
1.	Rhizobium	0.92
2.	Azotobacter	0.91
3.	Mycorrhiza	0.90
4.	Bluegreen algae	0.89
5.	Azolla	0.87
6.	Azospirillum	0.85
7.	Phosphobacteria	0.82
8.	Phosphate releasing fungi	0.79

Table V**Age group of farmers practicing sustainable agriculture**

(N= 60)

Category	Number of farmers	Percentage
Young	14	23.33
Middle	32	53.34
Old	14	23.33
Total	60	100.00

Table VI

Educational level of farmers practicing sustainable agriculture
(N= 60)

Category	Number of farmers	Percentage
Illiterate	0	0
Primary	8	13.33
Middle school	6	10.00
High school	8	13.33
College	38	63.34
Total	60	100.00

school education level of farmers was 13.33, 10.00 and 13.33, respectively.

4.2.3 Family size

The farmers practicing sustainable agriculture were classified into two groups depending on the family size and the results were tabulated in Table VII.

The results indicate that more than half of the farmers practicing sustainable agriculture had more than five members (56.67 per cent) in the family. However, 43.33 per cent of farmers had, small family i.e. less than five people.

4.2.4 Size of land holdings

Table VIII gives information relating to the size of land holdings of farmers practicing sustainable agriculture. The results revealed that a greater majority (96.67 per cent) of the farmers belonged to big farmers group. A very small percentage (3.33) belonged to small farmers group.

4.2.5 Mass media exposure

Farmers practicing sustainable agriculture were classified according to their mass media exposure to find out whether this factor had any association with in adoption of sustainable agriculture. Table IX summarises this information. The results of

Table VII**Family size of farmers practicing sustainable agriculture**

(N= 60)

Category	Number of farmers	Percentage
Small family	26	43.33
Big family	34	56.67
Total	60	100.00

Table VIII
Agricultural land owned by farmers practicing sustainable
agriculture
(N= 60)

Category	Number of farmers	Percentage
Small farmers	2	3.33
Big farmers	58	96.67
Total	60	100.00

Table IX**Mass media exposure of farmers practicing sustainable agriculture**

(N= 60)

Category	Number of farmers	Percentage *
Listening to farm radio	58	96.66
Listening & viewing farm information on Television	49	81.66
Reading farm information printed material	56	93.33

* More than one response is possible

this table point out that majority of the farmers were listening (96.66 per cent), viewing (81.66 per cent) and reading (93.33 per cent) farm information in Radio, Television and printed material respectively.

In the mass media exposure category it was observed that all the sample farmers were either listening to farm information in radio or listening and viewing farm information on Television or reading printed material of farm information. All farmers had access to more than one source of information.

4.2.6 Organisational participation

In order to see whether farmers organisational participation had any thing to do with the adoption of sustainable agriculture, the respondent farmer's were grouped into three categories as presented in Table X. It was clearly observed that more than half of the farmers (50 per cent) practicing sustainable agriculture had high organisational participation. However, 40 per cent of farmers had medium organisational participation and only 10 per cent of them had low organisational participation.

4.2.7 Extension participation

Farmers practicing sustainable agriculture were classified into three groups based on their extension participation to find out whether this factor had any thing to do in adoption of sustainable agriculture. Table XI summarises this informations.

Table X
Organisational participation of farmers practicing sustainable
agriculture
(N= 60)

Category	Number of farmers	Percentage
High	30	50
Medium	24	40
Low	6	10
Total	60	100

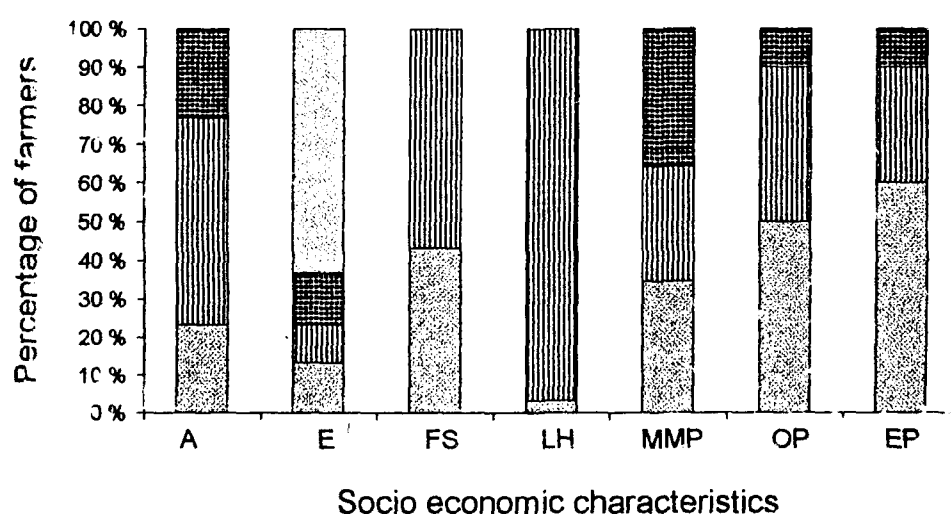
Table XI

**Extension participation of farmers practicing sustainable
agriculture**

(N= 60)

Category	Number of farmers	Percentage
High	36	60
Medium	18	30
Low	6	10
Total	60	100

Fig. 1 : Socio economic characteristics of farmers practicing sustainable agriculture



Column 4	College education
Column 3	Old age, High school, Print media, Low organisational and extension participation
Column 2	Middle age, Middle school, Big family, Large size holding, Radio + T.V. Medium organisational and extension participation.
Column 1	Young age, Primary education, Small family, Small holding, Radio listening, High organisational and extension participation.

A : Age
 E : Education
 FS : Family size
 LH : Land holding
 MMP : Mass media participation
 OP : Organizational participation
 EP : Extension participation

It was evident from the table that 60 per cent of the farmers practicing sustainable agriculture had high extension participation. Further, 30 per cent and 10 per cent of the farmers had medium and low extension participation. Almost all farmers practicing sustainable agriculture had extension participation at different degree.

4.3 ENTREPRENEURIAL BEHAVIOUR OF FARMERS PRACTICING SUSTAINABLE AGRICULTURE.

The data of Table XII furnishes the entrepreneurial behaviour index of farmers practicing sustainable agriculture. The entrepreneurial behaviour index ranged from 7.25 to 8.83. The farmers practicing sustainable agriculture had high entrepreneurial behaviour, like Innovativeness (8.83) followed by Decision making ability (8.62), Achievement motivation (8.25), Risk taking ability (7.85), Information seeking ability (7.68), Co-ordinating ability (7.50) and Leadership ability (7.25).

The computed F ratio was significant, this indicated clearly that each component of entrepreneurial behaviour was significantly different from the other. This also revealed that there was significant contribution from each component to overall entrepreneurial behaviour of farmers.

Table XII

**Relative importance of entrepreneurial behaviour index of
farmers practicing sustainable agriculture**

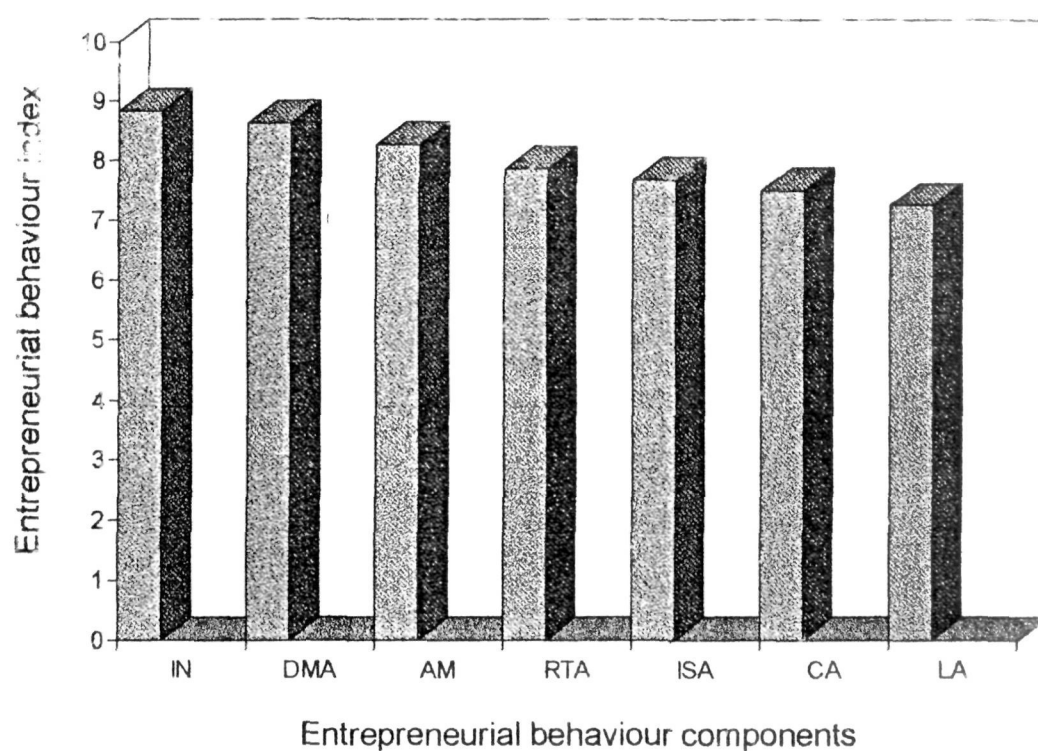
(N = 60)

Sl. No.	Components of the entrepreneurial behaviour	Scale value
1.	Innovativeness	8.83
2.	Decision making ability	8.62
3.	Achievement motivation	8.25
4.	Risk taking ability	7.85
5.	Information seeking ability	7.68
6.	Co-ordinating ability	7.50
7.	Leadership ability	7.25

F = 25.61**

** Significant at P = 0.01 level

Fig. II : Relative importance of entrepreneurial behaviour index of farmers practicing sustainable agriculture



IN = Innovativeness
DMA = Decision making ability
AM = Achievement motivation
RTA = Risk taking ability
ISA = Informaiton seeking ability
CA = Co-ordinating ability
LA = Leadership ability

4.4 SUSTAINABLE AGRICULTURAL PRACTICES ADOPTED AND DIFFERENT TYPE OF CROPS GROWN BY FARMERS

4.4.1 Sustainable agricultural practices adopted by farmers

Table XIII reveals information on adoption of Sustainable agriculture practices by farmers. A greater majority (66.66 per cent and 63.33 per cent) of the farmers adopted Organic Farming and Integrated Farming respectively.

Similarly, 60 per cent and 55 per cent of the farmers adopted Integrated Pest Management and Bio-fertilizers use respectively. Further, Integrated Nutrient Management was adopted by 45 per cent of the farmers. However, Soil and Water conservation and Agro-forestry was adopted by 43.33 per cent and 36.66 per cent of the farmers respectively. Majority of the farmers adopted more than two sustainable practices at a point of time.

4.4.2 Sustainable practices adopted in different crops by farmers

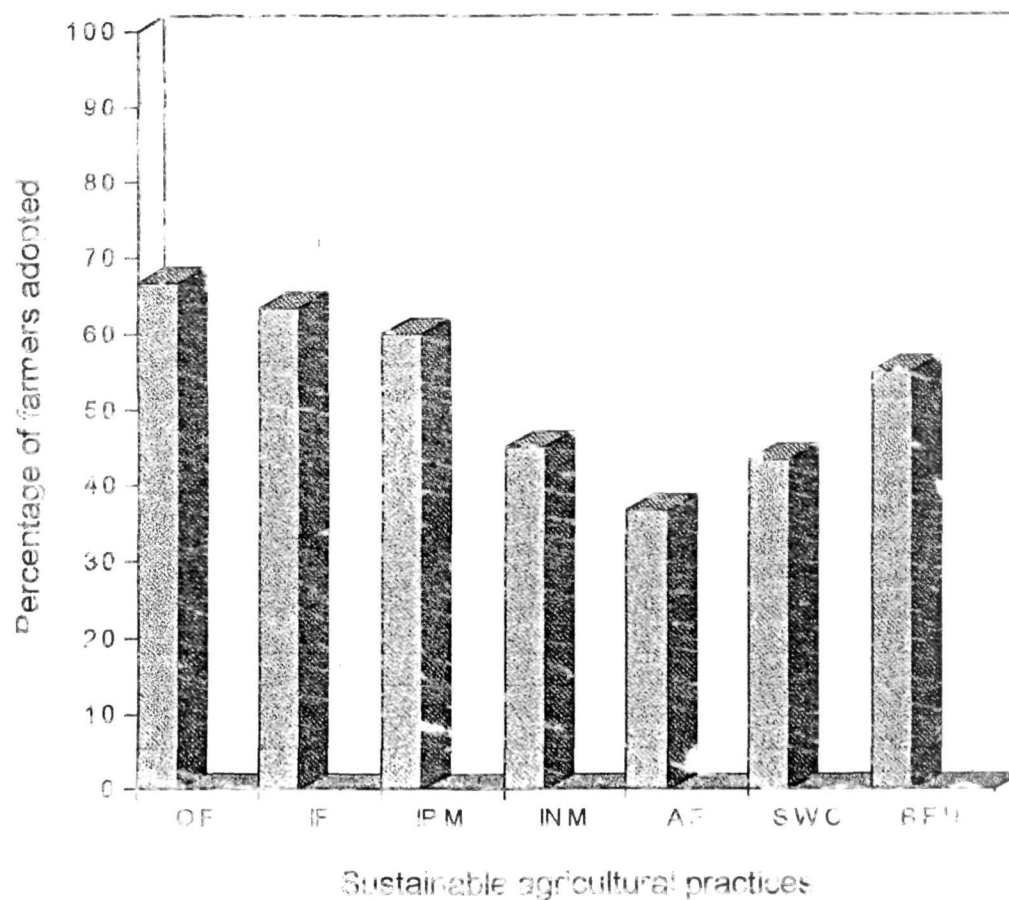
The responses obtained from farmers regarding the crops grown and sustainable practices adopted were presented in Table XIV. The results of the table indicates the type of crops grown and sustainable practices adopted by them. In cereals and vegetables 78.33 per cent and 70.00 per cent of the farmers adopted sustainable practices respectively. Where as 63.33 per cent and 51.67 per cent of the farmers adopted sustainable practices in pulses and oil seeds, respectively. Further, in fruits, plantations and cash

Table XIII
Sustainable agricultural practices adopted by farmers
(N = 60)

Sl. No	Category	Number of farmers	Percentage*
1.	Organic Farming	40	66.66
2.	Integrated Farming	38	63.33
3.	Integrated Pest Management	36	60.00
4.	Integrated Nutrient Management	27	45.00
5.	Agro-forestry	22	36.66
6.	Soil and Water conservation	26	43.33
7.	Bio-fertilizer use	33	55.00

* more than one response is possible

Fig. III : Sustainable agricultural practices adopted by farmers



OF = Organic Farming

IF = Integrated Farming

IPM = Integrated Pest Management

INM = Integrated Nutrient Management

AF = Agro-forestry

SWC = Soil and Water conservation

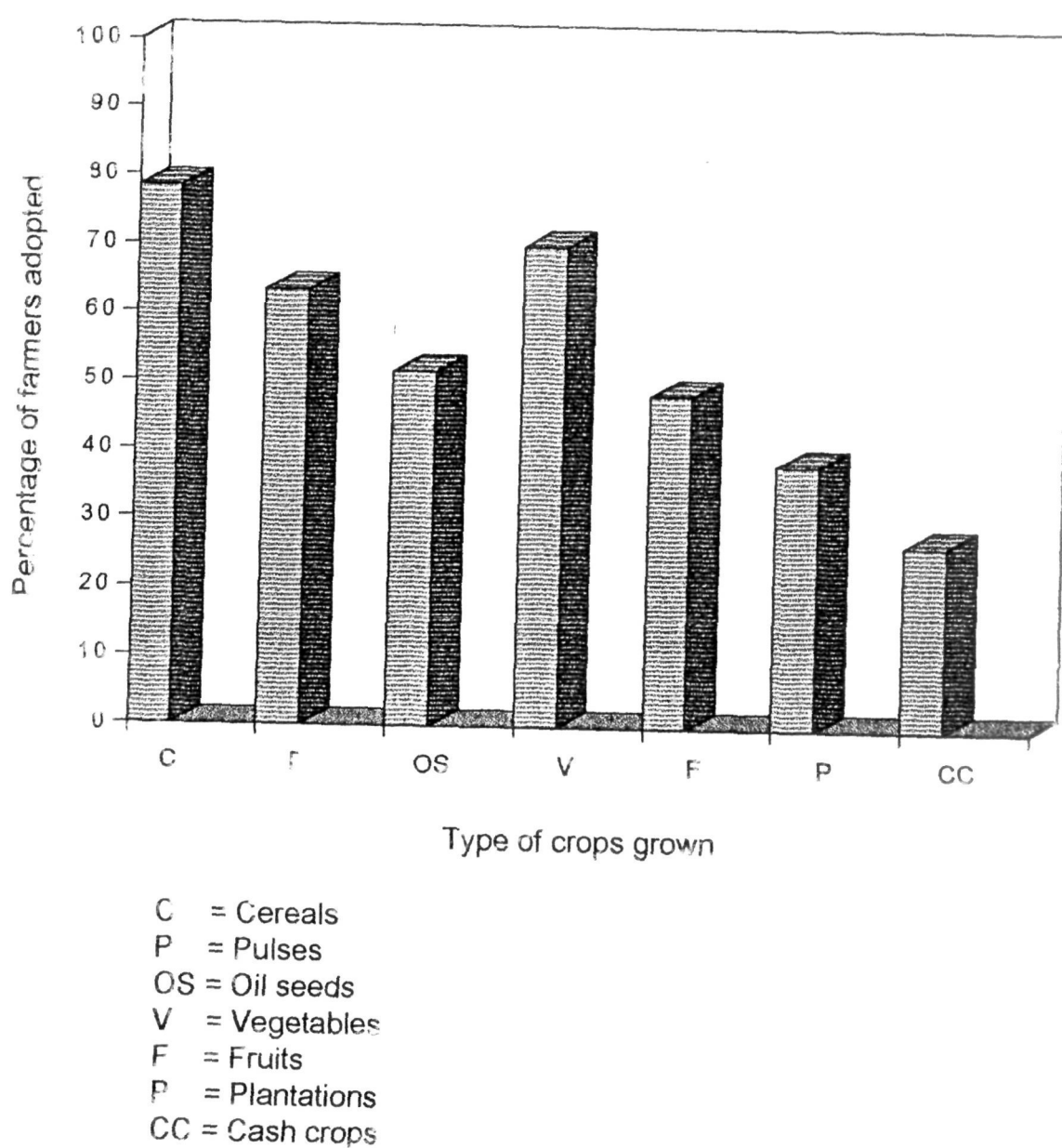
BFU = Bio-fertilizer use

Table XIV
Sustainable agricultural practices adopted in different crops
by farmers
(N= 60)

Sl. No	Category of crops	Number of farmers	Percentage*
1.	Cereals	47	78.33
2.	Pulses	38	63.33
3.	Oil seeds	31	51.67
4.	Vegetables	42	70.00
5.	Fruits	29	48.33
6.	Plantations	23	38.33
7.	Cash crops	16	26.67

* more than one response is possible

Fig. IV : Sustainable agricultural practices adopted in different crops by farmers



crops 48.33 per cent, 38.33 per cent and 26.67 per cent of farmers adopted sustainable practices.

4.5 IRRIGATION FACILITY AND ANIMALS OWNED BY THE FARMERS PRACTICING SUSTAINABLE AGRICULTURE

4.5.1 Irrigation facility of farmers practicing Sustainable agriculture

Table XV indicates the irrigation facility of farmers practicing Sustainable agriculture. According to the results of the table 33.34 per cent of farmers had irrigation facility upto 5 acres. Further 30.00 per cent and 26.66 per cent of farmers had irrigation facility 5-10 acres and more than 10 acres respectively. However, 10 per cent of the farmers practicing sustainable agriculture had no irrigation facility.

4.5.2 Animals owned by the farmers practicing Sustainable agriculture

Perusal of Table XVI furnishes information on animal owned by the farmers practicing Sustainable agriculture. A majority (60 per cent) of the farmers owned more than 10 large animals. Further, 26.67 per cent of the farmers had animals between 5 and 10. However, 13.33 per cent of the farmers had below 5 animals. All the farmers practicing Sustainable agriculture owned animals. This may be because of animal importance in sustainable agriculture.

Table XV**Irrigation facility of farmers practicing sustainable agriculture**

(N= 60)

Irrigation facility	Number of farmers	Percentage
No irrigation	6	10
Upto 5 acres	20	33.34
More than 5 acres Upto 10 acres	18	30.00
More than 10 acres	16	26.66
Total	60	100.00

Fig. V : Irrigation facility of farmers practicing sustainable agriculture

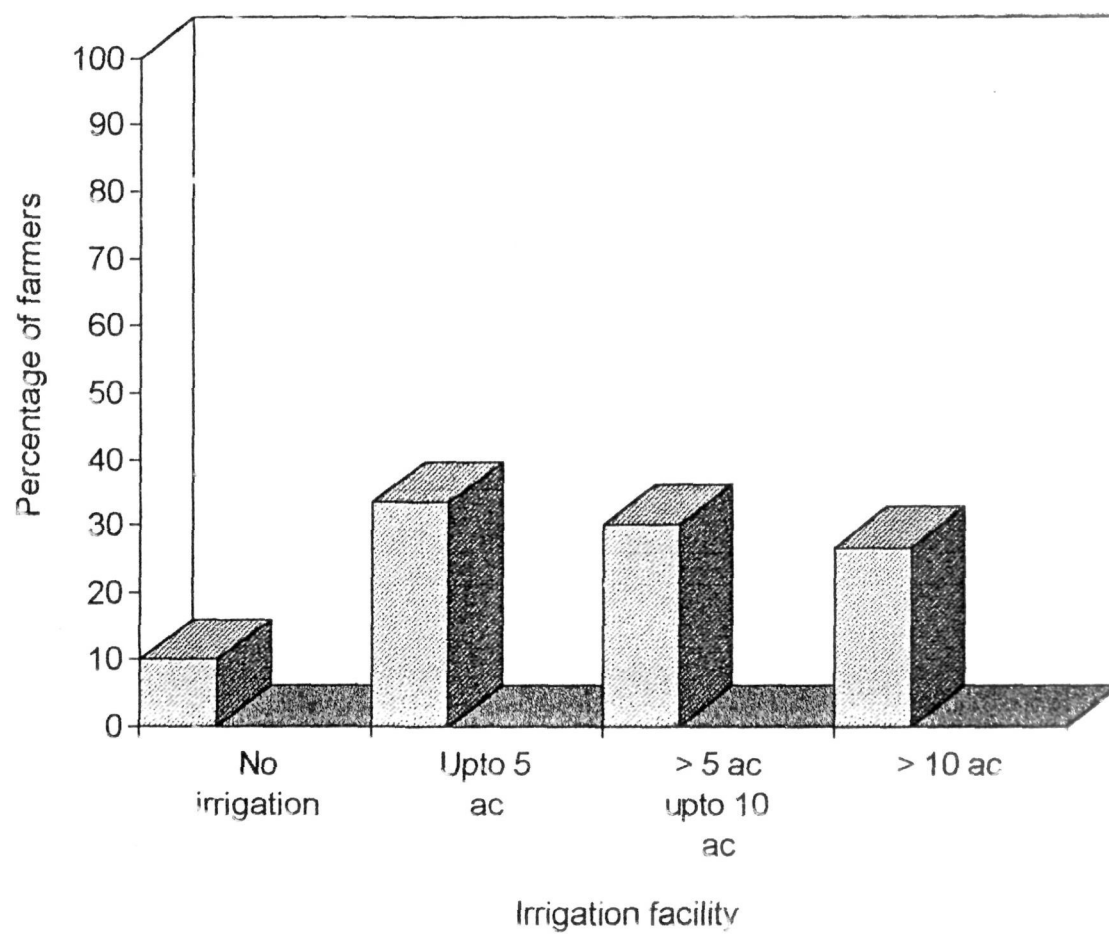
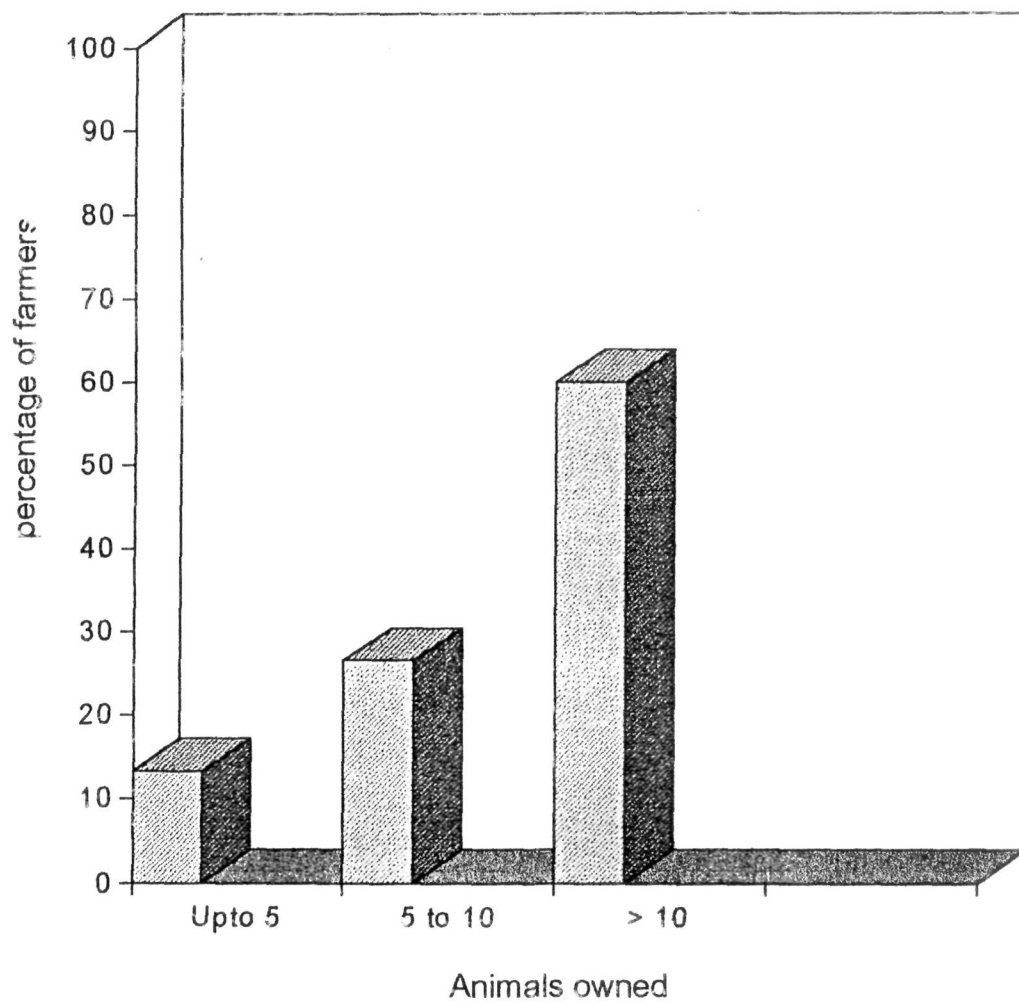


Table XVI**Large animals owned by farmers practicing sustainable agriculture**

(N= 60)

Category	Number of farmers	Percentage
Owning upto 5 animals	8	13.33
Owning 5-10 animals	16	26.67
Owning more than 10 animals	36	60.00
Total	60	100.00

Fig. VI : Large animals owned by farmers practicing sustainable agriculture



4.6 CONSTRAINTS FACED BY FARMERS IN ADOPTION OF SUSTAINABLE AGRICULTURE

Table XVII reports results pertaining to constraints faced by farmers in adoption of sustainable agriculture. The farmers practicing Sustainable agriculture were facing some problems at various levels of adoption. This table reveals that a greater majority (80 per cent) of the farmers practicing sustainable agriculture were facing policy constraints related to policy of the government with respect to support price for produce and crop insurance. Similarly, 65 per cent and 55 per cent of the farmers were facing technological constraints and infrastructural constraints respectively.

Further, 50 per cent and 51.67 per cent of the farmers were facing information transfer constraints and service and supply constraints respectively. However, 13.33 per cent and 10 per cent of the farmers were facing personal constraints and operational constraints respectively. The other type of constraints faced by the farmers can be observed from the Table XVII.

4.7 SUSTAINABLE AGRICULTURAL PRACTICES ADOPTED BY FARMERS AND THEIR SOCIO-ECONOMIC CHARACTERISTICS

4.7.1 Sustainable agriculture and age

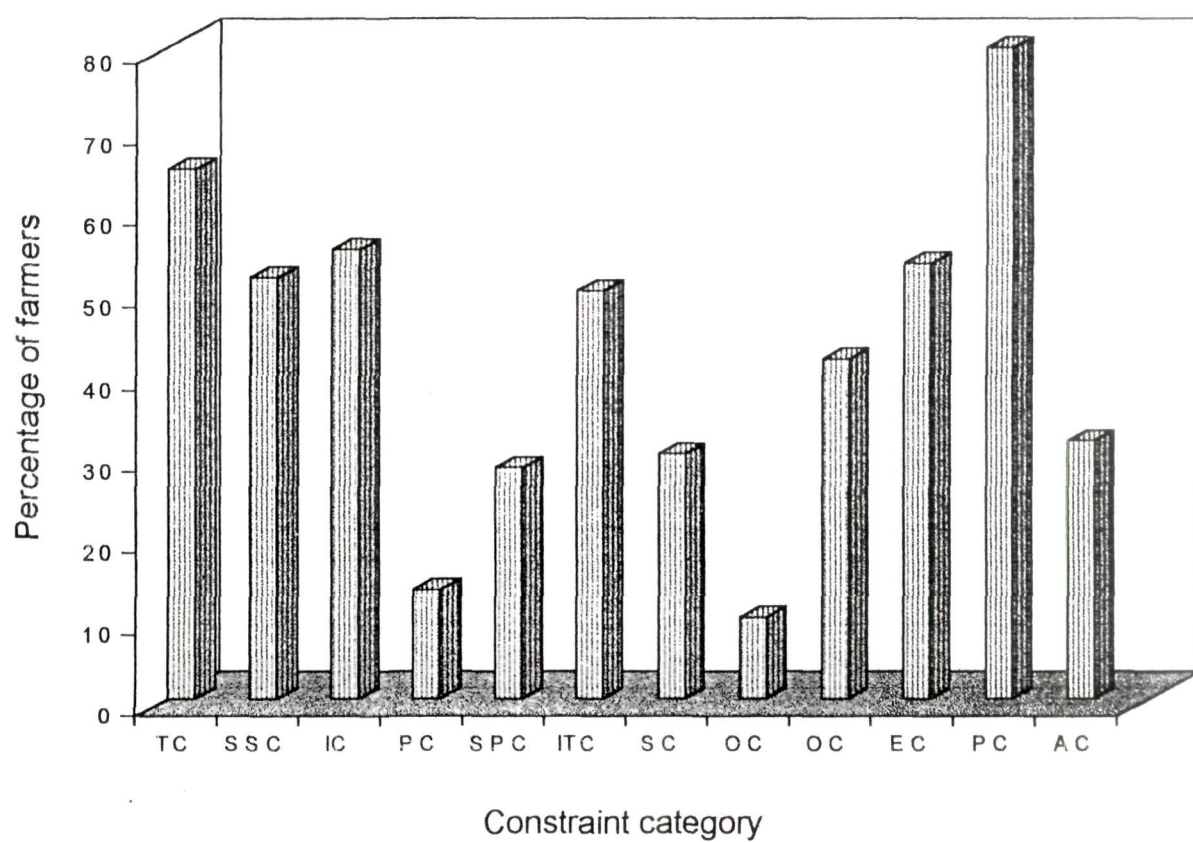
Table XVIII reveal that sustainable agricultural practices adopted by farmers under different age groups. It is observed from the table that 38.33 per cent of farmers adopted more than two sustainable agricultural practices were belonged to middle age group.

Table XVII
Constraints faced by farmers in adoption of sustainable
agriculture
(N= 60)

Sl. No	Constraint category	Number of farmers	Percentage*
1.	Technological constraints	39	65.00
2.	Service and supply constraints	31	51.67
3.	Infrastructural constraints	33	55.00
4.	Personal constraints	8	13.33
5.	Socio psychological constraints	17	28.33
6.	Information transfer constraints	30	50.00
7.	Situational constraints	18	30.00
8.	Operational constraints	6	10.00
9.	Organisational constraints	25	41.67
10.	Economic constraints	32	53.33
11.	Policy constraints	48	80.00
12.	Adhoc constraints	19	31.67

* more than one response is possible

Fig. VII : Constraints faced by farmers in adoption of sustainable agriculture



TC = Technological constraints
 SSC = Service and supply constraints
 IC = Infrastructural constraints
 PC = Personal constraints
 SPC = Socio-psychological constraints
 ITC = Information transfer constraints

SC = Situational constraints
 OC = Operational constraints
 OC = Organisational constraints
 EC = Economic constraints
 PC = Policy constraints
 AC = Adhoc constraints

Table XVIII**Sustainable agricultural practices adopted by farmers under different age groups**

(N = 60)

Category	Adopted atleast two practices		Adopted more than two practices		Total	
	Number	Percent	Number	Percent	Number	Percent
Young	5	8.33	9	15.00	14	23.33
Middle	9	15.00	23	38.33	32	53.34
Old	7	11.67	7	11.67	14	23.33
Total	21	35.00	39	65.00	60	100.00

 $\chi^2 = 2.05$ NS

d.f. : 2

Non significant

However, 15.00 per cent and 11.67 per cent of farmers adopted at least two sustainable agricultural practices were belonged to young and old age groups, respectively.

The chi square test conducted for the data was non significant. Therefore, there is no association between number of sustainable agricultural practices adopted by farmers and their age groups.

4.7.2 Sustainable agriculture and educational level

Sustainable agricultural practices adopted by farmers under different educational levels was presented in Table XIX. The data presented in the table indicates that 50 per cent of the farmers who had education up to college level adopted more than two Sustainable agricultural practices. Further, the primary, middle and high school level educated farmers adopted more than two Sustainable agricultural practices were 5.00 per cent, 3.33 per cent and 6.67 per cent, respectively.

The chi square for the data was found significant which indicated the association between educational level and adoption of sustainable agricultural practices by farmers.

4.7.3 Sustainable agriculture and size of land holdings

The data of Table XX furnishes information on the Sustainable agricultural practices adopted by farmers and their size of land holdings. A majority (65.00 per cent) of big farmers adopted more

Table XIX**Sustainable agricultural practices adopted by farmers under different educational level**

(N = 60)

Category	Adopted atleast two practices		Adopted more than two practices		Total	
	Number	Percent	Number	Percent	Number	Percent
Primary school	5	8.33	3	5.00	8	13.33
Middle school	4	6.67	2	3.33	6	10.00
High school	4	6.67	4	6.67	8	13.33
College	8	13.33	30	50.00	38	63.34
Total	21	35.00	39	65.00	60	100.00

 $\chi^2 = 9.34^*$

d.f. : 3

significant at 5 per cent level

Table XX**Sustainable agricultural practices adopted by farmers and their size of land holdings**

(N = 60)

Category	Adopted atleast two practices		Adopted more than two practices		Total	
	Number	Percent	Number	Percent	Number	Percent
Small farmers	2	3.33	0	0.00	2	3.33
Big farmers	19	31.67	39	65.00	58	96.67
Total	21	35.00	39	65.00	60	100.00

 $\chi^2 = 3.84^*$

d.f. : 1

significant at 5 per cent level

than two Sustainable agricultural practices but only 3.33 per cent of the small farmers adopted atleast two Sustainable agricultural practices.

The Chi square test conducted was found significant. Therefore, it can be concluded that there was association between adoption of Sustainable agriculture practices by farmers and their size of land holdings.

4.7.4 Sustainable agriculture and organisational participation

The results of the Table XXI reported that Sustainable agricultural practices adopted by farmers and their organisational participation. The farmers who had high organisational participation (41.67 per cent) adopted more than two Sustainable agricultural practices. Similarly, medium and low organisational participation group of farmers adopted Sustainable agricultural practices were 21.67 per cent and 1.67 per cent, respectively.

The chi square test was highly significant indicated close association between organisational participation and adoption of Sustainable agricultural practices by farmers.

4.7.5 Sustainable agriculture and extension participation

Farmers practicing Sustainable agricultural practices and their extension participation was presented in Table XXII. It was evident from the table that 48.33 per cent of farmers who had high extension

Table XXI

**Sustainable agricultural practices adopted by farmers and their
organisational participation**

(N = 60)

Category	Adopted atleast two practices		Adopted more than two practices		Total	
	Number	Percent	Number	Percent	Number	Percent
High	5	8.33	25	41.67	30	50.00
Medium	11	18.33	13	21.67	24	40.00
Low	5	8.33	1	1.67	6	10.00
Total	21	35.00	39	65.00	60	100.00

 $\chi^2 = 11.27^{**}$,

d.f. : 2

significant at 1 per cent level

Table XXII

Sustainable agricultural practices adopted by farmers and their extension participation

(N = 60)

Category	Adopted atleast two practices		Adopted more than two practices		Total	
	Number	Percent	Number	Percent	Number	Percent
High	7	11.67	29	48.33	36	60.00
Medium	9	15.00	9	15.00	18	30.00
Low	5	8.33	1	1.67	6	10.00
Total	21	35.00	39	65.00	60	100.00

 $\chi^2 = 11.77^{**}$

d.f. : 2

significant at 1 per cent level

participation adopted more than two Sustainable agricultural practices.

The chi square test conducted for the data was highly significant. It clearly indicated that there was close association between adoption of Sustainable agriculture practices by farmers and their extension participation.

4.8 ENTREPRENEURIAL BEHAVIOUR OF FARMERS AND THEIR SOCIO-ECONOMIC CHARACTERISTICS

4.8.1 Entrepreneurial behaviour and age

The data of the Table XXIII (a) revealed the mean entrepreneurial behaviour index of farmers practicing sustainable agriculture in different age groups. One way analysis of variance was conducted for the data and presented in Table XXIII (b).

The computed F ratio was significant. This indicated the significant difference in the entrepreneurial behaviour of farmers practicing sustainable agriculture under different age groups.

4.8.2 Entrepreneurial behaviour and educational level

The results of Table XXIV (a) indicated the mean entrepreneurial behaviour index of farmers practicing Sustainable agriculture under different educational levels. The data of the above table was subjected to the one way analysis of variance and the findings were furnished in Table XXIV (b).

Table XXIII (a)**Entrepreneurial behaviour and age group of farmers practicing sustainable agriculture**

(N= 60)

Category	Number of farmers	Mean entrepreneurial behaviour index
Young	14	84.32
Middle	32	78.86
Old	14	77.82
Total	60	

Table XXIII (b)**One way analysis of variance of entrepreneurial behaviour of farmers practicing sustainable agriculture in different age groups**

Source	df	Sum of squares	Mean square	F
Between	2	927.03	463.52	5.41**
Within	57	4879.75	85.61	
Total	59	5806.78		

** = Significant at 1 per cent level

**Figure 1: Entrepreneurial behaviour and age group of farmers
practising sustainable agriculture**

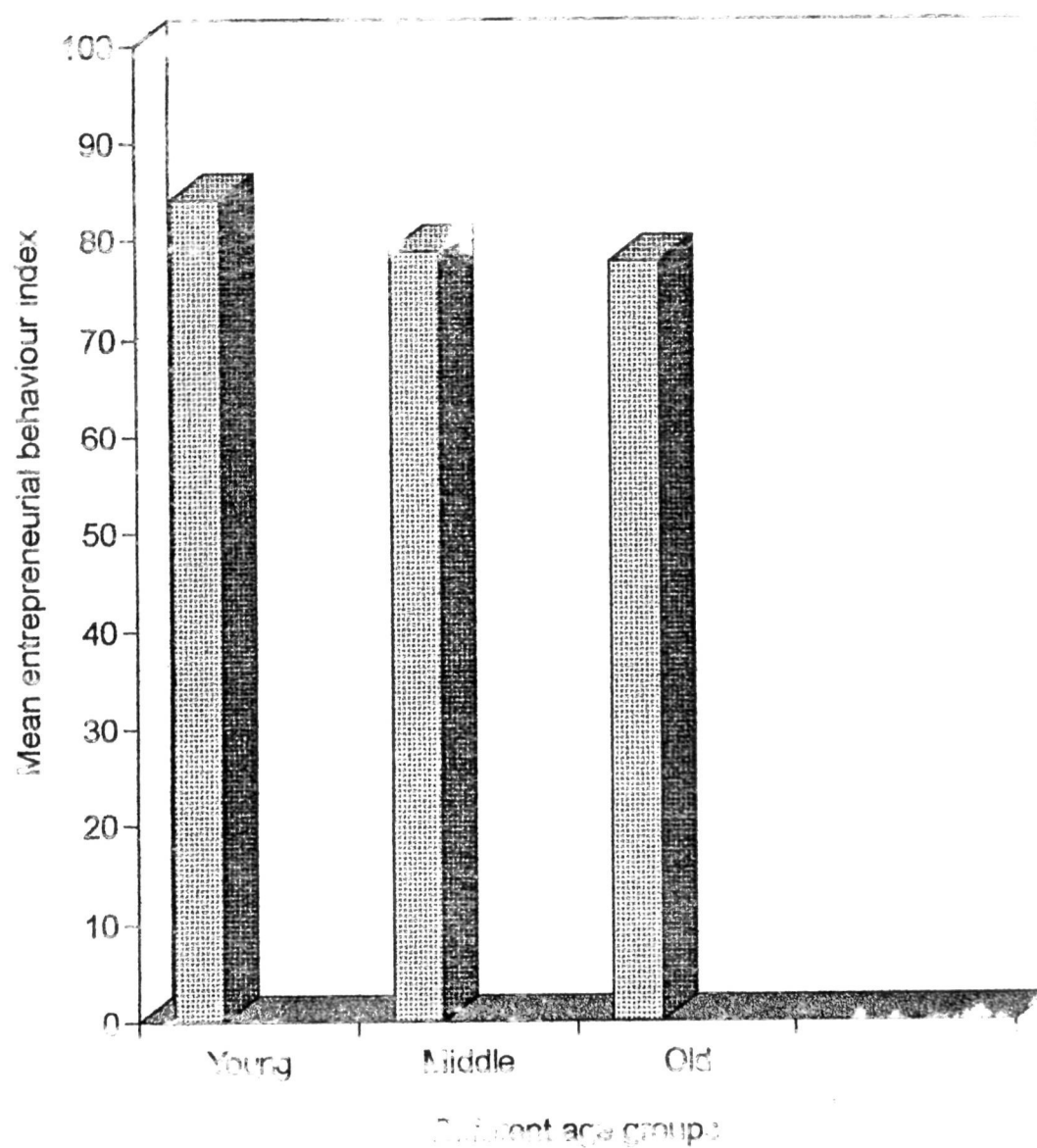


Table XXIV (a)

**Entrepreneurial behaviour and educational level of farmers
practicing sustainable agriculture**

(N= 60)

Category	Number of farmers	Mean entrepreneurial behaviour index
Primary	8	70.77
Middle school	6	75.40
High school	8	78.15
College	38	82.34
Total	60	

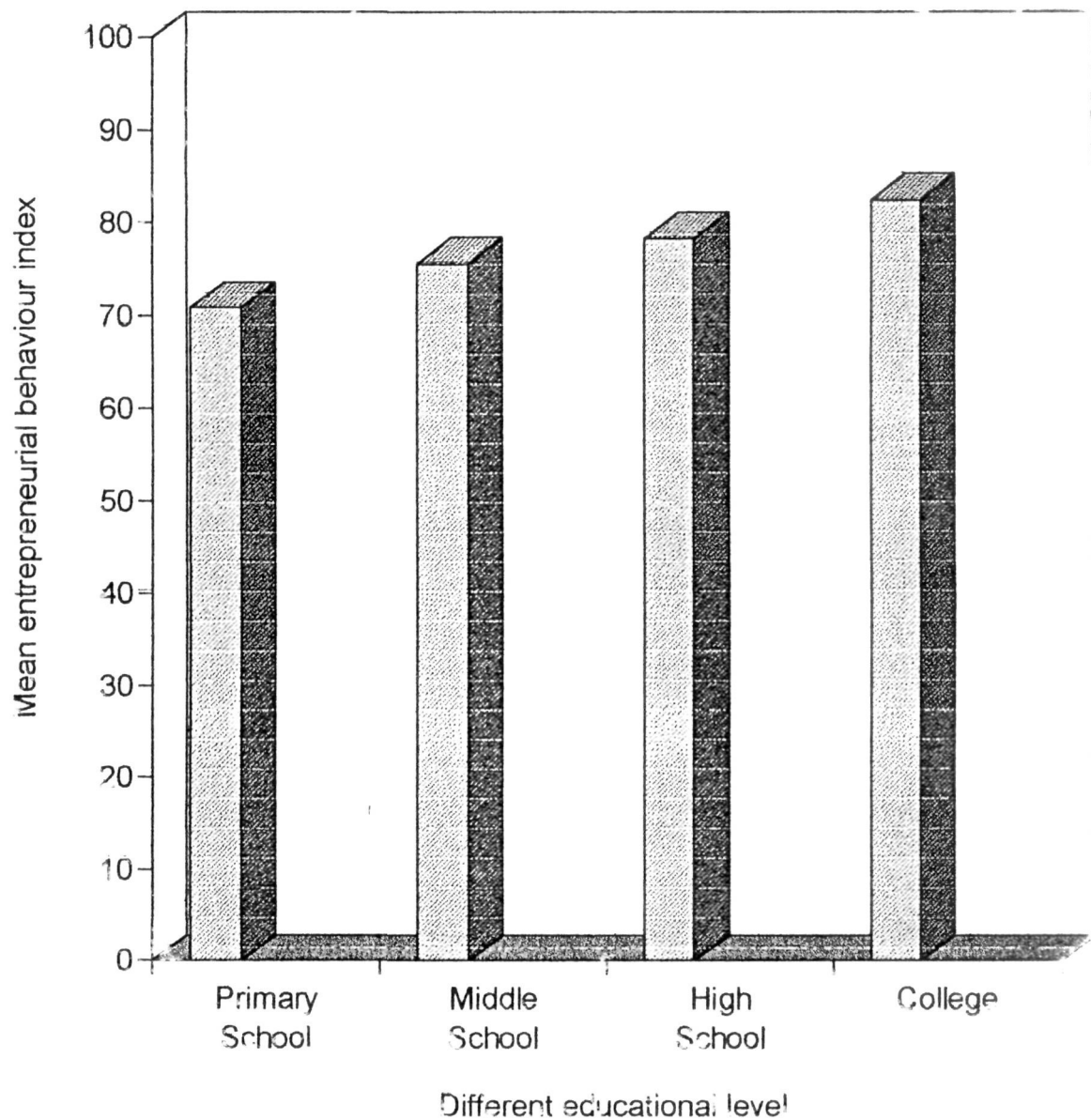
Table XXIV (b)

**One way analysis of variance of entrepreneurial behaviour of
farmers practicing sustainable agriculture in different educational
level**

Source	df	Sum of squares	Mean square	F
Between	3	1031.53	343.84	47.80**
Within	56	402.81	7.19	
Total	59	1434.34		

** = Significant at 1 per cent level

Fig. IX : Entrepreneurial behaviour and educational level of farmers practicing sustainable agriculture



The F ratio was found significant at one per cent level. Hence, there was significant difference in the entrepreneurial behaviour of farmers belonging to different educational levels.

4.8.3 Entrepreneurial behaviour and size of land holdings

Data on this aspects have been presented in Table XXV (a). The one way analysis of variance was conducted for the data and the results were summarised in Table XXV (b).

The F ratio calculated was found significant at one per cent level. This indicated that there was significant difference in the entrepreneurial behaviour of small and big farmers.

4.8.4 Entrepreneurial behaviour and organisational participation

Information on entrepreneurial behaviour of farmers practicing Sustainable agriculture and their organisational participation was presented in Table XXVI (a). The data were subjected to one way analysis of variance were furnished in Table XXVI (b).

The F ratio obtained was significant at one per cent level. This indicated that there was significant difference in the entrepreneurial behaviour of farmers having low, medium and high organisational participation.

4.8.5 Entrepreneurial behaviour and extension participation

The mean entrepreneurial behaviour index of farmers practicing sustainable agriculture and their level of extension

Table XXV (a)**Entrepreneurial behaviour and agricultural land owned by farmer practicing sustainable agriculture**

(N= 60)

Category	Number of farmers	Mean entrepreneurial behaviour index
Small farmers	2	50.40
Big farmers	58	80.91
Total	60	

Table XXV (b)**One way analysis of variance of entrepreneurial behaviour of farmers practicing sustainable agriculture and land owned by them**

Source	df	Sum of squares	Mean square	F
Between	1	1800.44	1800.44	194.98**
Within	58	535.56	9.23	
Total	59	2336.00		

** = Significant at 1 per cent level

Figure 5.11: Entrepreneurial behaviour and agricultural land owned by farmers practicing sustainable agriculture

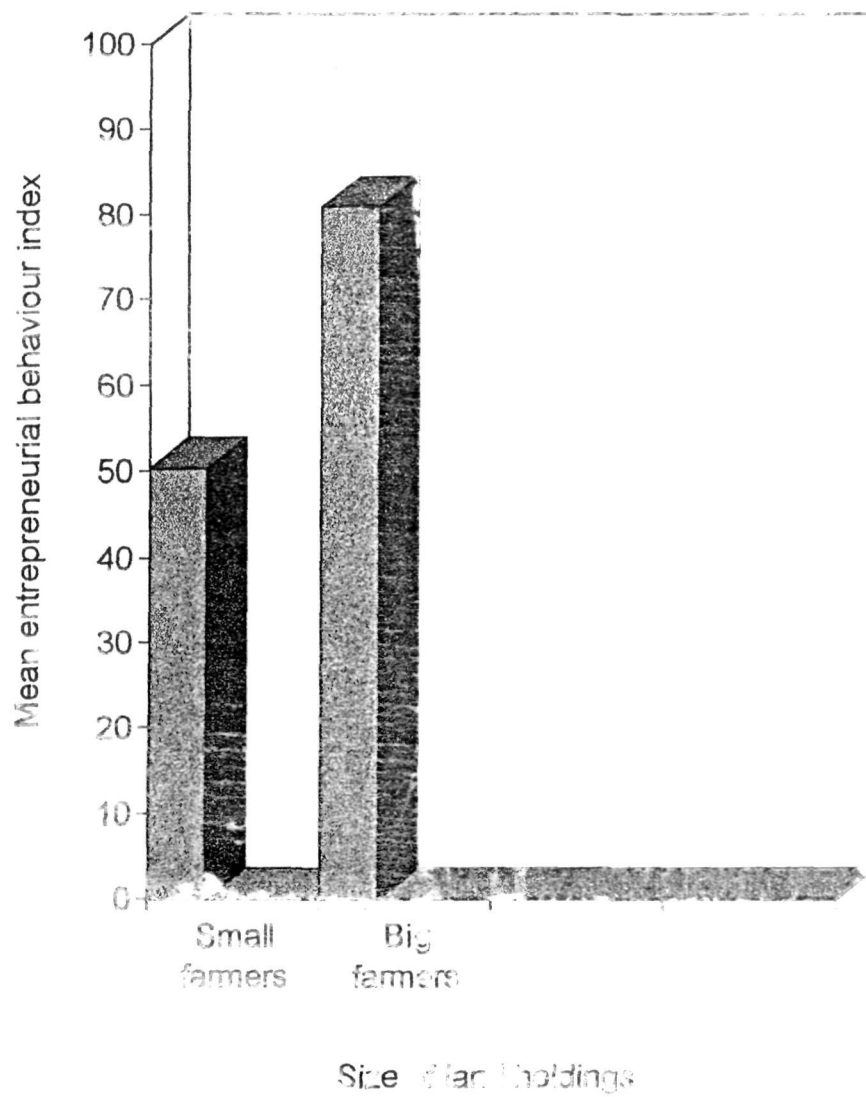


Table XXVI (a)

96

Entrepreneurial behaviour and organisational participation of farmers practicing sustainable agriculture

(N= 60)

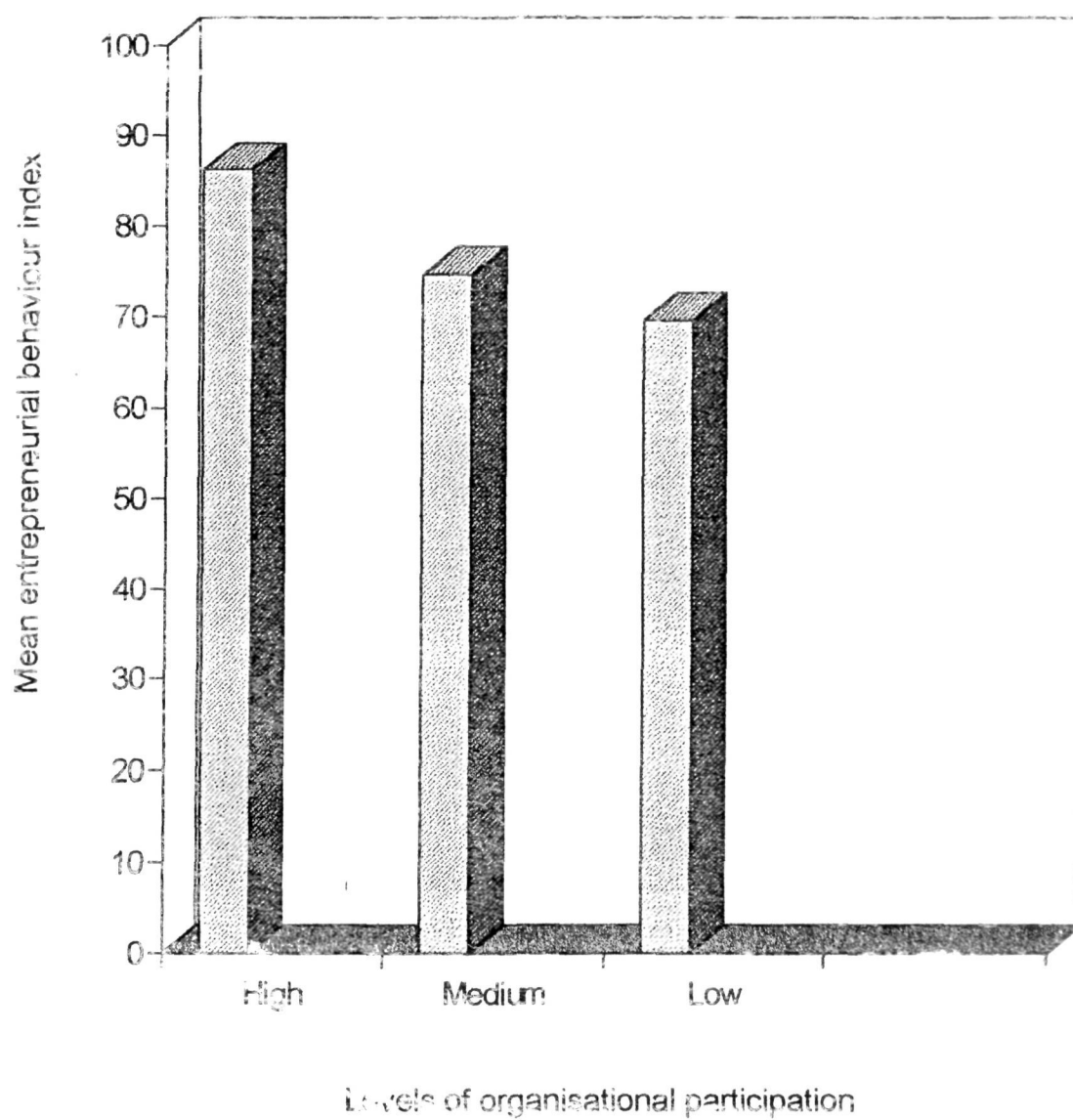
Category	Number of farmers	Mean entrepreneurial behaviour index
High	30	86.10
Medium	24	74.69
Low	6	69.73
Total	60	

Table XXVI (b)**One way analysis of variance of entrepreneurial behaviour of farmers practicing sustainable agriculture and their organisational participation**

Source	df	Sum of squares	Mean square	F
Between	2	2424.69	1212.34	237.16**
Within	57	291.38	5.11	
Total	59	2716.06		

** = Significant at 1 per cent level

Fig. XI : Entrepreneurial behaviour and organisational participation of farmers practicing sustainable agriculture



participation was presented in Table XXVII (a). The results of the table were subjected to one way analysis of variance and furnished in Table XXVII (b).

The F ratio computed was significant at one per cent level. This clearly indicated that there was significant difference in the entrepreneurial behaviour of farmers having high, medium and low extension participation.

4.9 RELATIONSHIP BETWEEN JUDGES OPINION AND ADOPTION OF SUSTAINABLE AGRICULTURAL PRACTICES BY FARMERS AND THEIR ENTREPRENEURIAL BEHAVIOUR

4.9.1 Sustainable agricultural practices adopted by farmers and judges opinion

The Table XXVIII furnishes information on relationship between standardized Sustainable agricultural practices based on opinion of judges and adoption of same practices by farmers. The results of the data were subjected to correlation coefficient .

The correlation coefficient was significant at one per cent level. This indicated the positive relationship and there was close association between the judges opinion and farmers adoption of standardized sustainable agricultural practices.

4.9.2 Entrepreneurial behaviour and sustainable agriculture

The data of the Table XXIX indicated the relationship between entrepreneurial behaviour and adoption of sustainable agricultural

Table XXVII (a)

Entrepreneurial behaviour and extension participation of farmers practicing sustainable agriculture

(N= 60)

Category	Number of farmers	Mean entrepreneurial behaviour index
High	36	84.09
Medium	18	75.84
Low	6	66.73
Total	60	

Table XXVII (b)

One way analysis of variance of entrepreneurial behaviour of farmers practicing sustainable agriculture and their extension participation

Source	df	Sum of squares	Mean square	F
Between	2	1966.13	983.06	148.97**
Within	57	376.16	6.60	
Total	59	2342.28		

** = Significant at 1 per cent level

Fig. XII : Entrepreneurial behaviour and extension participation of farmers practicing sustainable agriculture

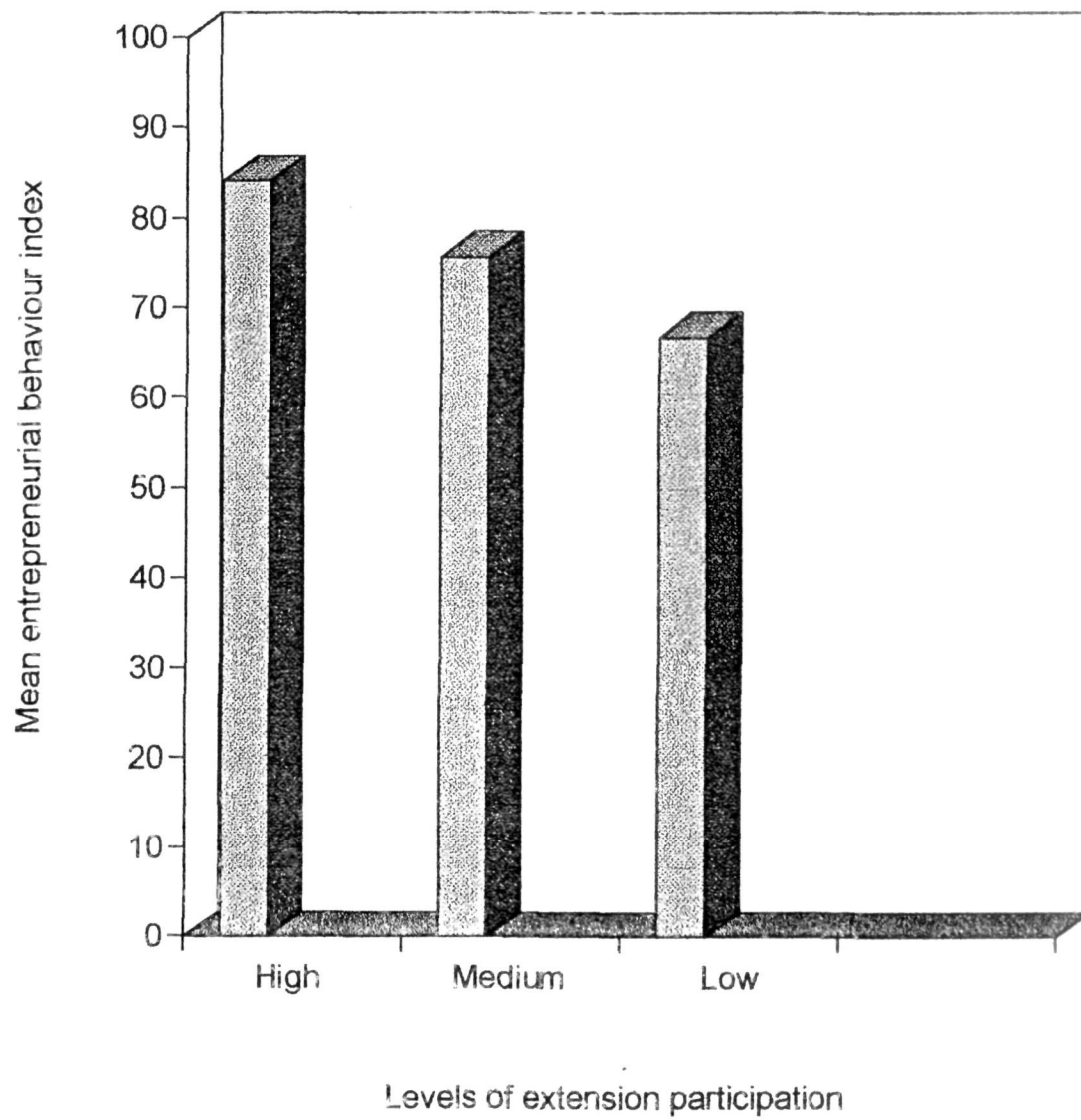


Table XXVIII

**Correlation between judges opinion and farmers adoption of
sustainable agricultural practices**

Sl No	Sustainable practice	Judges relevancy co-efficient	Percentage of farmers adopted	Correlation coefficient (r)
1.	Organic Farming	0.95	66.66	0.714**
2.	Integrated Farming	0.93	63.33	
3.	Integrated Pest Management	0.88	60.00	
4.	Integrated Nutrient Management	0.86	45.00	
5.	Agro-forestry	0.84	36.66	
6.	Soil and Water conservation	0.82	43.33	
7.	Bio-fertilizer use	0.80	55.00	

** = Significant at 1 per cent level

Table XXIX

Correlation between sustainable agricultural practices adoption index and entrepreneurial behaviour index

Sl. No.	Category	Mean score	Correlation coefficient (r)
1.	Mean sustainable agriculture practices adoption index	59.36	0.783 **
2.	Mean entrepreneurial behaviour index	78.61	

** Significant at 1 per cent level

practices by farmers. The correlation coefficient was significant at one per cent level indicated the positive relationship between entrepreneurial behaviour and sustainable agricultural practices adopted by farmers. Further, this clearly shows that there was close association between entrepreneurial behaviour and adoption of sustainable agricultural practices by farmers.

4.10 RECOMMENDATIONS FOR ADOPTION OF SUSTAINABLE AGRICULTURE BY FARMERS IN THE COUNTRY

As reported by FAO publication in India about 500 million people dependent on Agriculture. Agricultural development is a complex process. It is particularly so in respect of sustainable agriculture. Sustainable agriculture should involve the successful management of resources for agriculture to satisfy changing human needs while maintaining or enhancing the quality of environment and conserving natural resources. Adoption of sustainable agriculture depends on the entrepreneurial behaviour of farmers as reported in results of the study. Hence, there is need for entrepreneurial training to farmers through proper Entrepreneurial Development Programmes (EDP). In this context, there is need for development of EDP models to train farmers. These EDP models should focus on the key role of entrepreneurs such as (1) to initiate (2) to establish (3) to build (4) to develop (5) to manage (6) to compete and (7) to specialize. The EDP models have to be more dynamic,

flexible and adequate looking to the needs of the farmers for sustainable agriculture development. The efficiency of the model should be measured against a preagreed bench mark because of different socio-economic strata existing in the country. Further, these models should be suitable to a variety of combinations. Hence, the models should be developed by examining the EDP practices in other nations particularly China, Korea and Taiwan.

DISCUSSION

CHAPTER V

DISCUSSION

The results of the study were discussed under the following headings :

- 5.1 Identification and Standardization of Sustainable agricultural practices.
- 5.2 Socio-economic characteristics of farmers practicing Sustainable agriculture.
- 5.3 Entrepreneurial behaviour of farmers practicing Sustainable agriculture.
- 5.4 Sustainable agricultural practices adopted and different type of crops grown by farmers.
- 5.5 Irrigation facility and animals owned by the farmers practicing sustainable agriculture.
- 5.6 Constraints faced by farmers in adoption of sustainable agriculture.
- 5.7 Sustainable agricultural practices adopted by farmers and their socio-economic characteristics.
- 5.8 Entrepreneurial behaviour of farmers and their socio-economic characteristics.
- 5.9 Relationship between judges opinion and adoption of sustainable agricultural practices by farmers and their entrepreneurial behaviour.
- 5.10 Recommendations for adoption of sustainable agriculture by farmers in the country.

As reported in the results chapter the analysis of relevancy coefficient varied from 0.81 to 0.94 for the sustainable practices under broad items. Based on the relevancy coefficient index seven broad items which possessed 0.7 and above were selected and arranged in descending order namely Organic Farming, Integrated Farming, Integrated Pest Management, Integrated Nutrient Management, Agro forestry, Soil and Water conservation and Bio-fertilizers use. Similarly, sub items under each broad item were also subjected to analysis of relevancy coefficient and only such practices passed the criteria of 0.7 are considered for discussion. The relevancy coefficient of the sub-items ranged from 0.75 to 0.95. This is a clear indication that sustainable agricultural practices were properly standardized. Further, these practices can be used as such for the measurement of sustainable agriculture. Since these practices were developed based on the opinion of 52 judges from 18 countries of the world.

**5.2 SOCIO ECONOMIC CHARACTERISTICS OF FARMERS
PRACTICING SUSTAINABLE AGRICULTURE**

5.2.1 Age group

According to the present study, the farmers practicing sustainable agriculture were belonged to all age groups. However, more than half (53.34 per cent) of the farmers practicing sustainable

agriculture were belonged to middle age group. These findings get support from the results reported earlier by Ranganath (1996) and Nagabushan (1997). Further, it is interesting to note that equal percentage of young and old farmers adopted sustainable agriculture.

5.2.2 Educational level

The farmers practicing sustainable agriculture were belonged to different educational levels but it was interesting to note that no illiterate farmer adopted sustainable agriculture. These findings get support from previous studies reported on this aspect by Grunig (1970), Ranganath (1996) and Nagabushnam (1997). However, results of the study indicated that higher college educational level was associated with greater adoption of sustainable agriculture. This may be because of their exposure to communication which inturn might influenced the adoption of sustainable agriculture.

5.2.3 Family size

More than fifty per cent of farmers practicing sustainable agriculture had large sized families i.e. more than five members in the family these findings differ from the research results reported by Ranganath (1996) who had observed that more than half of the farmers practicing organic agriculture had small family size.

The present results could be explained by the fact that large size family having large size holdings are commonly observed to have more number of animals useful to sustainable agriculture. On the other hand, small family size with little financial support might have adopted low cost organic agriculture practices.

5.2.4 Size of land holdings

The results of this study have indicated that a majority of farmers (96.67 per cent) practicing sustainable agriculture had large size holdings and only negligible per cent of them were small farmers.

These results were in agreement with previous studies reported on sustainable agriculture by Dunlop *et al.* (1992), Gowda (1996) and Nagabushnam (1997) in different eco-systems on sustainability of agriculture. This might be due to the fact that big farmers had accessibility to get information from all sources about the sustainable agriculture and had ability to invest as compared to small farmers.

5.2.5 Mass media exposure

As reported in the results chapter, most of the farmers practicing sustainable agriculture were exposed to mass media either by listening to farm radio or viewing farm information on Television

or reading farm information printed material. This is in conformity with the findings reported by Nagabushnam (1997).

Further, these results read along with findings under education and age group indicated that the farmer practicing sustainable agriculture although pervaded different age and educational groups was further conditioned by the degree of exposure of farmers to mass media sources particularly radio , Television and Newspaper.

5.2.6 Organizational participation

As reported earlier in the results chapter more than fifty per cent of farmers practicing sustainable agriculture had high organizational participation. Further all the farmers were members at least in one organization. This may be due to the fact that higher education and large size holdings of the farmers facilitated them to become members in more number of local organizations. In turn organisations played role in exposing farmers which in turn influenced the adoption of sustainable agriculture.

5.2.7 Extension participation

The results of the study indicated that more than half (60.00 per cent) of the farmers practicing sustainable agriculture had higher extension participation. Whereas, Nagabushan (1997) reported that nearly 50 per cent of farmers had medium extension participation.

However, in the present study 30 per cent of the farmers practicing sustainable agriculture had medium extension participation.

Further, the results indicated that all the farmers practicing sustainable agriculture had participated in more than one extension activity and had sufficient extension exposure. This might have helped them to adopt sustainable agriculture.

5.3 ENTREPRENEURIAL BEHAVIOUR OF FARMERS PRACTICING SUSTAINABLE AGRICULTURE.

The results of the study indicated that farmers practicing sustainable agriculture had high entrepreneurial behaviour. The findings of the study get support from previous related studies conducted by Nandapurkar (1980), Sethy *et al.* (1984), Waghdhare and Wakde (1989), Nasser Ahmed & Kakoty (1993), Venkata Ramaiah (1993), Patel (1995), Porchezian *et al.* (1998). These authors reported that the farmers with high entrepreneurial behaviour had adopted new practices in agriculture and related fields. Further they stated that farmers with high entrepreneurial behaviour adopt new practices in agriculture and related fields earlier than farmers with low entrepreneurial behaviour.

In the present study, the adoption of sustainable agricultural practices by farmers may be because of their high entrepreneurial behaviour. Hence, it may be concluded that the interference of entrepreneurial characters influence the adoption of sustainable

agriculture. Further, each component of entrepreneurial behaviour was independent and contributed for overall entrepreneurial behaviour of farmer.

5.4 SUSTAINABLE AGRICULTURAL PRACTICES ADOPTED AND DIFFERENT TYPE OF CROPS GROWN BY FARMERS

5.4.1 Sustainable agricultural practices adopted by farmers

The findings of the present study indicated that majority of farmers adopted more than two sustainable agricultural practices at a point of time. However, a few farmers adopted all the sustainable agricultural practices. This may be because of high entrepreneurial behaviour. Further, farmers with high education, high mass media and high extension participation along with high entrepreneurial behaviour influence helped farmers to adopt more number of sustainable agricultural practices. Earlier studies have not reported on this aspect. However, Nandapurkar (1980) reported that small farmers with above qualities had adopted recommended agricultural practices.

5.4.2 Sustainable practices adopted in different crops by farmers

Results of the present study indicated that majority of the farmers had grown more than five crops in a year out of seven crops mentioned the table like cereals, pulses, oil seeds, vegetables, fruits, plantations and cash crops, adopted sustainable agricultural

practices. This may be due to high entrepreneurial behaviour associated with large size of holdings. Further different type of crops were also covered under sustainable practices. However, the percentage of sustainable practices adopted by the farmers varies from 78.33 per cent in cereals to 26.67 per cent in cash crops. This variation in adoption level could be due to marketing facilities and degree of difficulty attached with these crops.

5.5 IRRIGATION FACILITY AND ANIMALS OWNED BY THE FARMERS PRACTICING SUSTAINABLE AGRICULTURE

5.5.1 Irrigation facility

Results of the study indicated that more than fifty per cent of farmers had irrigation facility for more than five acres. Irrigation plays an important role in adoption of sustainable agriculture. The farmers were aware of merits of irrigation. This may be due to high entrepreneurial behaviour. However, few farmers had no irrigation facility.

5.5.2 Animals owned

As reported in the results, majority of the farmers had more than ten large animals. It is well known that livestock enterprise or large animals are very important for sustainable agriculture adoption. If the farmers had to use dung as organic manure for sustainable agriculture without maintaining animals they had to

incur additional cost for purchasing dung. Further, agricultural operations can be managed through animal power without incurring additional cost. Keeping these things in view the farmers with high entrepreneurial behaviour maintained more animals.

5.6 CONSTRAINTS FACED BY FARMERS IN ADOPTION OF SUSTAINABLE AGRICULTURE

As indicated in the results chapter majority of the farmers had adopted sustainable agricultural practices had faced several constraints in adoption of sustainable agricultural practices. Among these constraints policy of the government, non-availability of technology, economic aspects, transfer of information in time, infrastructural facilities were the major constraints that farmers encountered in adoption of sustainable agriculture.

Findings of this research get support from earlier studies reported by Prasad and Mahipal (1991), Singh and Laharia (1992) and Rathakrishna (1997). According to these authors farmers had faced similar type of constraints in adoption of recommended practices in agricultural crops.

5.7 SUSTAINABLE AGRICULTURAL PRACTICES ADOPTED BY FARMERS AND THEIR SOCIO-ECONOMIC CHARACTERISTICS

5.7.1 Sustainable agriculture and age

The present study reveal that 65.00 per cent of the farmers adopted more than two sustainable agricultural practices. However,

the study indicated that there was no association between age group of farmers and number of sustainable agricultural practices adopted by them. The probable reason that the age was not influenced the adoption of more number of sustainable agricultural practices can be explained by the commonly observed phenomenon in respect of adoption of innovations in Indian agriculture, wherever assistance is provided by the concerned agencies different age group farmers do not differ in their adoption.

5.7.2 Sustainable agriculture and educational level

The results of the study reported that educational level was associated with adoption of number of sustainable agricultural practices by farmers. Higher the educational level more number of sustainable agricultural practices were adopted by farmers. This may be because of higher education exposes farmers to more communication methods. Which in turn might have influenced the adoption of more number of sustainable agricultural practices by farmers because of their awareness and concern about environment.

5.7.3 Sustainable agriculture and size of land holdings

There was association between adoption of number of sustainable agricultural practices and size of land holdings. It was observed from the results of the study that big farmers adopted more number of sustainable agricultural practices compared to small

farmers. This may be because of farmers large size holdings enabled them to adopt more number of sustainable agricultural practices compare to farmers with small size of holdings.

5.7.4 Sustainable agriculture and organisational participation

The results of the study furnished that there was a close relationship between organisational participation and adoption of sustainable agricultural practices. Farmers who had higher organisational participation adopted more number of sustainable agricultural practices compared to medium and low level of organisational participation. This may be because of their exposure to more number of organisations facilitated them to adopt more sustainable agricultural practices. This may be generally explained by the fact that organisations play an important role in exposing an individual, which in turn influence the adoption.

5.7.5 Sustainable agriculture and extension participation

The data of the results indicated that there was close association between number of sustainable agricultural practices adopted by farmers and their extension participation. Farmers participation in different extension educational activities helped them to adopt more number of sustainable agricultural practices. Probably this may be because of extension participation encouraged farmers to acquire more knowledge and skill apart from developing

favourable attitude, in turn resulted in adoption of more sustainable agricultural practices.

5.8 ENTREPRENEURIAL BEHAVIOUR OF FARMERS AND THEIR SOCIO ECONOMIC CHARACTERISTICS

5.8.1 Entrepreneurial behaviour and age

The results of the study reported that entrepreneurial behaviour of farmers practicing sustainable agriculture differ with their age groups. Young farmers had higher entrepreneurial behaviour index compared to middle and old age groups. The findings of the study get support from Moulik and Rao (1979). However, the present results differ from Nandapurkar (1980) who studied entrepreneurial behaviour of small farmers. This may be because of majority of farmers practicing sustainable agriculture in the present study belonged to high education group and owned large size holdings.

5.8.2 Entrepreneurial behaviour and educational level

The findings of the study indicated that farmers practicing sustainable agriculture had higher educational level and also had high entrepreneurial behaviour as compared to those had low education. The findings of the study were in confirmation with research reported by Derossi (1971) and Nandapurkar (1980). Similar results have been observed in case of adoption studies under

Indian conditions, where education had been observed to be a significant factor encouraging farmer adoption. 115

5.8.3 Entrepreneurial behaviour and size of land holdings

According to the present study big farmers practicing sustainable agriculture had high entrepreneurial behaviour compared to small farmers. Earlier studies have not reported on this aspect. However, Nandapurkar (1980) reported that if management services are provided small farmers will also improve their entrepreneurial behaviour.

5.8.4 Entrepreneurial behaviour and organisational participation

As indicated by the results of the study farmers practicing sustainable agriculture and also who had high organisational participation had high entrepreneurial behaviour index. The findings of the study get support from earlier studies reported by Pareek and Nadkarni (1978) and Nandapurkar (1980). This may be because of the organisations played important role in participation by exposing farmers practicing sustainable agriculture which in turn influenced entrepreneurial behaviour.

5.8.5 Entrepreneurial behaviour and extension participation

The results of the study reported that farmers practicing sustainable agriculture and also who had high extension

participation were high in their entrepreneurial behaviour and differed significantly from medium and low extension participation groups. Extension participation encourages farmers to have achievement orientation which in turn likely to result in high entrepreneurial behaviour. The earlier research studies reported by McClelland and Winter (1969), Mehata (1976), and Nandapurkar (1980) had supported the present investigation. These studies reported that extension participation helps to become more effective and achieve better results on their own sphere of activity.

5.9 RELATIONSHIP BETWEEN JUDGES OPINION AND ADOPTION OF SUSTAINABLE AGRICULTURAL PRACTICES BY FARMERS AND THEIR ENTREPRENEURIAL BEHAVIOUR

5.9.1 Sustainable agricultural practices adopted by farmers and judges opinion

The results of the study had showed that there was a close association between the standardized sustainable agricultural practices based on opinion of judges and percentage of farmers adopted them. The significance of correlation coefficient had indicated that the judges opinion and farmers adoption were similar. Hence, the standardized practices were appropriate and can be recommended for adoption at field level.

5.9.2 Entrepreneurial behaviour and sustainable agriculture

The results of the study reported that farmers practicing more number of sustainable agriculture practices had higher entrepreneurial behaviour index. Further, there was a positive relationship between adoption of sustainable agriculture practices and entrepreneurial behaviour of farmers.

The earlier research studies related to adoption of recommended agriculture practices conducted by Nandapurkar (1980), Sethy *et al.* (1984), Waghdhare and Wakde (1989), Nasser Ahmed and Kakoty (1993), Patel (1995), Porchezian *et al.* (1998) were also reported similar findings. Hence, entrepreneurial behaviour influence the adoption of sustainable agriculture.

5.10 RECOMMENDATIONS FOR ADOPTION OF SUSTAINABLE AGRICULTURE BY FARMERS IN THE COUNTRY.

Development of any nation depends primarily on the important role played by entrepreneurs. Hence, the part played by entrepreneurs in sustainable agriculture development is of vital importance to utilize the available resources efficiently. Results of this study suggested that the future progress of farming in the country depends on the entrepreneurial behaviour of farmers. Under these circumstances what public policy can play a role to create an environment conducive to entrepreneurship ? what should be the

extent and nature of Governmental intervention in the economic sphere to achieve this purpose ?. These questions have been subject of debate. Historically, Governments world over gave a little support for development of entrepreneurship in farmers eventhough entrepreneurship helps to improve the standard of living in the society. Under the present circumstances entrepreneurship development among farmers is urgently required for adoption of sustainable agriculture in the country. The range and scope of entrepreneurial activity depends on the Government laws, regulations, procedures, policy, attitude, general orientation and a state of readiness through exerting a directives and dynamic influence. Further, the role of the Government in entrepreneurship development programmes (EDP) should be considered as an important aspect through (1) Government interference and regulations to enhance EDP (2) Creating best environment for entrepreneurial activities by adopting favourable policy through direct participation and (3) Farming favourable public policy to help entrepreneurship development.

SUMMARY

CHAPTER VI

SUMMARY

Recognising that commercial agriculture had several disadvantages, promotion of sustainable agriculture was considered as an important aspect for food security in harmony with nature. Practicing sustainable agriculture by every farmer is difficult. Identifying useful parameters that enable the adoption of sustainable agriculture practices is a vital task. In spite of several advantages of sustainable agriculture, it requires high entrepreneurial behaviour among farmers for adoption. Hence, a research study on entrepreneurial behaviour of farmers practicing sustainable agriculture was taken up in the International Conference "Food Security in harmony with Nature". organised by University of Agricultural Sciences, Bangalore in Collaboration with IFOAM-ASIA during Dec. 1-4, 1997. A large number of scientists, extension workers, administrators and NGO's from different countries of the world and farmers from different states of India attended the conference. Taking opportunity of the above conference this research study was conducted with the following objectives :

- (1) To identify and standardize sustainable agricultural practices.
- (2) To study socio-economic characteristics of farmers practicing sustainable agriculture.
- (3) To observe entrepreneurial behaviour responsible for adoption of sustainable agriculture.
- (4) To formulate recommendations for adoption of sustainable agriculture in the country.

The study was conducted during 1997-98. The opinion of experts and farmers who attended an International Conference “Food Security in harmony with Nature” were used for the study. A random sample of 52 judges and a random sample of 60 farmers selected were used for the study to standardize sustainable agricultural practices and to study the entrepreneurial behaviour of farmers practicing sustainable agriculture, respectively.

A special questionnaire was developed on sustainable agricultural practices for obtaining opinion of judges to standardize sustainable agricultural practices and used in the International Conference and collected responses. The responses obtained were analysed by relevancy co-efficient and standardized the sustainable agricultural practices.

A structured interview schedule for collecting information from farmers practicing sustainable agriculture, was developed and used in the conference for collecting the data from farmers who attended the international conference. The data were summarized by using percentages.

THE IMPORTANT FINDINGS OF THE STUDY WERE AS FOLLOWS:

Identified and Standardized sustainable agricultural practices

- (1) Fifty two judges used for standardization of sustainable agricultural practices were belonged to 18 countries of the world.

- (2) Sixty respondent farmers practicing sustainable agriculture spread over seven different states of the country were used in the study.
- (3) The standardized sustainable agricultural practices were grouped under seven broad items with sub items under each category.
- (4) The seven broad items namely Organic Farming, Integrated Farming, Integrated Pest Management, Integrated Nutrient Management, Agro-Forestry Soil and Water conservation and Bio-fertilizer use. Which passed the relevancy coefficient index of 0.70 were identified as the most useful standardised sustainable agricultural practices. Likewise, each broad item had a combination of sub-items of sustainable agricultural practices.

Socio-economic characteristics

- (5) Farmers practicing sustainable agriculture belonged to all the age groups but more than half of them belonged to middle age group (53.34 per cent).
- (6) Farmers practicing sustainable agriculture belonged to different educational levels but majority (63.34 per cent) of farmers had college education. Further, it was interesting to note that none of the illiterate farmers adopted sustainable agriculture.
- (7) More than half (56.67 per cent) of the farmers practicing sustainable agriculture had more than four members in their families.

- (8) A majority (96.67 per cent) of farmers practicing sustainable agriculture were big farmers.
- (9) All the farmers practicing sustainable agriculture were exposure to mass media. They were listening to farm radio, viewing farm information on Television and reading printed materials related to farm information.
- (10) Further, more than 50 per cent of farmers practicing sustainable agriculture had higher organisational participation. They were active participants in local organisations.
- (11) A majority (60 per cent) of farmers practicing sustainable agriculture had higher extension participation. However, ten percent of farmers had low extension participation.

Entrepreneurial behaviour

- (12) A greater majority of farmers practicing sustainable agriculture had high entrepreneurial behaviour.

Sustainable agricultural practices adoption, different crops grown irrigation facility and animals owned

- (13) Majority of the farmers adopted more than two sustainable agricultural practices at a point of time.
- (14) Majority of the farmers adopted sustainable agricultural practices in more than five different crops.
- (15) A greater majority (90 per cent) of the farmers practicing sustainable agriculture had irrigation facility. Among them 26.66

per cent had more than ten acres under irrigation. However, ten per cent of the farmers had no irrigation facility.

- (16) Majority (60 per cent) of the farmers practicing sustainable agriculture owned more than ten large animals. However, 13.33 per cent of the farmers owned up to five animals.

Constraints faced

- (17) Results reported that all the majority of the farmers practicing sustainable agriculture were facing certain constraints like Technological constraints (65 per cent), Service and supply constraints (51.67 per cent), Infrastructural constraints (55.00 per cent), Personal constraints (13.33 per cent), Socio-psychological constraints (28.33 per cent), Information transfer constraints (50 per cent), Situational constraints (30 per cent), Operational constraints (10 per cent), Organisational constraints (41.67 per cent), Economic constraints (53.33 per cent), Policy constraints (80.00 per cent) and Adhoc constraints (31.67 per cent).

Sustainable agricultural practices adopted by farmers and their socio-economic characteristics

- (18) Thirty eight per cent of farmers practicing more than two sustainable agricultural practices belonged to middle age group. However, there was no significant association between number of

sustainable agricultural practices adopted and age group of farmers.

- (19) There was an association between adoption of sustainable agricultural practices and educational level of farmers. Fifty per cent of farmers practicing more than two sustainable agricultural practices had college education.
- (20) Sixty five per cent of the farmers practicing more than two sustainable agricultural practices had large size holdings farm or land. Further, there was an association between size of land holdings and adoption of sustainable agricultural practices.
- (21) There was close association between organisational participation and adoption of sustainable agricultural practices. Further, 41.67 per cent of the farmers practicing more than two sustainable agricultural practices had higher organisational participation.
- (22) Forty eight per cent of the farmers practicing more than two sustainable agricultural practices had higher extension participation. There was a close association between extension participation and adoption of sustainable agricultural practices by farmers.

Entrepreneurial behaviour of farmers and their socio-economic characteristics

- (23) The entrepreneurial behaviour of farmers practicing sustainable agriculture differ significantly in different age groups.

- (24) Farmers practicing sustainable agriculture with high formal education had high entrepreneurial behaviour index compared to low education groups.
- (25) Big farmers practicing sustainable agriculture had higher entrepreneurial behaviour compared to small farmers.
- (26) Farmers practicing sustainable agriculture with higher organisational participation were also high in their entrepreneurial behaviour compared to medium and low groups.
- (27) Farmers with high extension participation and adopted sustainable agricultural practices had also high in their entrepreneurial behaviour index compared to medium and low extension participation categories.
- (28) There was positive relation between standardized sustainable agricultural practices based on opinion of judges and adoption of sustainable agricultural practices by farmers.
- (29) Adoption of sustainable agriculture depends on entrepreneurial behaviour of farmers and vice-versa.

IMPLICATIONS

1. The important findings of this study reveals that the seven sustainable agricultural practices standardized can be used by the Government as well as Non-governmental organisations for promoting sustainable agriculture in the country. The implication is that the results of the study indicated that there was nothing

wrong in the standardized sustainable agricultural practices as such for measurement of sustainable agriculture, since, the sustainable agriculture practices developed were based on opinion of 52 judges from 18 countries of the world.

2. Another most important finding of this study has also pointed out that farmers practicing sustainable agriculture had high entrepreneurial behaviour. The implication is that it is not difficult to make farmers to adopt sustainable agriculture if they are trained properly for entrepreneurship development by using different extension methods.
3. The study indicated that farmers practicing sustainable agriculture belonged to middle age, high education, high mass media exposure and high extension participation groups. Implication from the study is that concerned organisations should create facilities to educate farmers and expose them to mass media and extension participation for adoption of sustainable agriculture in the country.
4. The study pointed out that the majority of the farmers practicing sustainable agriculture in the country were belonged to group of large size holdings. Further, small farmers participation in sustainable agriculture programmes was negligible. The important implication of the study is that there is need to motivate small farmers by concerned organisations for adoption of sustainable agriculture in the country.

5. The present study indicated that most of the farmers practicing sustainable agriculture had irrigation facility. Further, ten per cent of farmers adopted sustainable agriculture with no irrigation facility. Implication for the study is that there is need to motivate dryland farmers by the concerned organisations for adoption of sustainable agriculture.
6. The study furnished that the farmers practicing sustainable agriculture maintained animals. Implication from the study is that the concerned organisation should encourage and motivate farmers for maintaining animals.
7. The results of the study also revealed that the farmers practicing sustainable agriculture had faced several constraints like Policy constraints, Technological, Infrastructural, Service and supply and Information transfer constraints etc. The implication from the study is that the Government should create facilities to overcome these constraints by developing appropriate technologies along with their transfer to reach large number of farmers in time for adoption of sustainable agriculture.

In conclusion, there is a need to develop appropriate policy by the government, procedures, regulations, laws, directives and influence through a state of readiness for implementation of sustainable agriculture in the country.

RECOMMENDATIONS FOR FUTURE RESEARCH

This study has been taken up as a post-graduate research programme by an individual student. As such the study has been limited only to few aspects due to time and resource limitations of the researcher. [This type of important study calls for a pilot project research pursuit by taking the entire country as an unit. There is a need to standardize sustainable agriculture practices in different agro climatic conditions of the country. Similarly, there is a need to study the entrepreneurial behaviour of farmers in more detail relating to different aspects of agricultural development. Further, there is need to develop entrepreneurial development programme (EDP) models to train different types of farmers under different agro climatic conditions for development of sustainable agriculture in the country. Hence, there is broad scope for future research in this line.

REFERENCES

CHAPTER VII

REFERENCES

- Ajit Kanitkar, 1994, Integrating the extension approach in entrepreneurship developing activities : Rationale, Experience and issues. *Small Enterprises Development Management of Extension*, **21** (2) : 1-19.
- Akhouri, M.M.P., 1979, Entrepreneurial economic success index (EESI) for assessing entrepreneurial success. *Small Enterprises Development Management of Extension*, **6** (1) : 36-49.
- Alison Rieple and Shailendra Vyakarnam, 1994, Corporate entrepreneurship- A review. *The Journal of Entrepreneurship*, **3** (1) : 1-20.
- Allen *et al.*, 1991, Integrating social environmental and economic issues in sustainable agriculture. *J. Alternative Agric.*, **6** : 34-39.
- Alteri, M.A., 1986, Agroecology : The Scientific Basis of Alternative Agriculture. Div. of Biol. Control, Univ. of California, Berkeley.
- Anand singh, K. and Krishna, K.V.S.M., 1994, Agricultural Entrepreneurship - The concept and evidence. *Journal of Entrepreneurship*, **3** (1) : 97-113.
- Anonymous, 1971, *Identifying potential Entrepreneurs*. Behavioural Sciences centre. Report submitted to Gujarat Industrial Development Corporation Ahemadabad.
- Anonymous, 1989, Decision reached on sustainable agriculture. *Agronomy News*, January 15.
- Anonymous, 1990, Putting Sustainability into context, Sustainable Farming and the Role of Farmers Organisation, IFAP Seminar for developing country farm leader, Adelaide, Australia.
- Anonymous, 1991, Sustainable agriculture and rural development in Asia and Pacific. Regional document No. 2. FAO/ Netherlands Conference on Agriculture and Environment, The Netherlands, 15-19, April.

- Anonymous, 1992, Development and the Environment : World Development Report, World Development indicators, published for the World Bank, Oxford University Press, U.S.A.
- Anonymous, 1996 a, Manual of Orientation course on entrepreneurship development in agriculture held from Dec. 17-31, 1996. Organised by Entrepreneurship development cell. IARI, New Delhi.
- Anonymous, 1996 b, Rich poor gap widening everyday, The Indian Express, Daily News paper, July 18, 1996.
- Anonymous, 1996 c, Organic manures for crops. Seminar Report, Indian Council of Agricultural Research, University of Agricultural Sciences, Bangalore.
- Baldwin, Cathy, 1991, The Role of Earthworms in Agro-ecosystem. *The Cultivar*, **9** (1) : 5-6.
- Berna, J., 1970, Industrial entrepreneurship in Madras Stanford Research Institute. P - 10.
- Chandrapoojary, M., 1997, Entrepreneurship : push or pull effect. *Small Enterprises Development Management of Extension*, **24** (3) : 11-18.
- Cole, A.H., 1959, Business enterprise in its social setting. Mass Harward University Press., Cambridge.
- Collins, O.F. and Moore, D.G., 1964, The enterprising man east lansing : Bureau of Business and Economic Research, Michigan State University.
- Cantillon, R., 1755, Quated by, Cochran, T.C., Entrepreneurship International Encyclopedia of the social sciences, 5 McMillan and Press, 1968. pp. 88-90.
- Conway, R.O., Doering, Nehring, R. and Frerichs, S., 1991, A perspective and sustainable agriculture, Draft Manuscript.
- Dannof, C.H., 1949, *Observations at entrepreneurship in Agriculture change and the entrepreneurs*. Harvard University Press. Cambridge.

- Dennis M. Ray, 1993, Entrepreneurial Attributes, skills and training programme. *The Journal of Entrepreneurship*, **2** (1) : 33-46.
- Deotale, S.L., Chaudari, M.R., Tidke, G.R. and Nagalwade, L.D., 1994, Adoption behaviour among vegetable growers in Nagpur district. *Journal of Soil and crops*, **4** (2) : 141-144.
- Derossi, F., 1971, *The Mexican Entrepreneur* Development Centre of the organisation for Economic Co-operation and Development, Paris.
- Dinesh N. Awasthi, 1992, Entrepreneurship and the growth of firms. *An Exploratory study of the Dyestuffs industry in Ahmedabad*, **1** (1) : 37-74.
- Dover, M. and Talbot, L.M., 1987, *To Feed the Earth : Agro-ecology for Sustainable Development*. World Resources Institute, Washington, D.C.
- Dwarikinath, R., 1973, Adoption incentives related to packages of practices of high yielding varieties in Mysore state, India. Unpublished Ph.D. Thesis, Cornell University, Cornell, New York.
- Dunlop, R.E., Bens, C.E., Howell, R.E. and Wond, T., 1992, What is sustainable agriculture ? An Empirical Examination of Faculty and Farmer Definitions. *J. of Sustainable Agriculture*, **3** (1) : 5-39.
- Edwards, C.A., 1987, The Concept of Integrated systems in lower input sustainable agriculture. *American Journal of Alternative Agriculture*, **2** : 148-152.
- Edwards, C.A., 1988, Agricultural Ecosystem Environment, Proceedings of International Symposium at Padova, Italy, 25-35.
- Elongovan, R. and Vasanthakumar, J., 1997, Extension efforts of state department of agriculture in promoting eco-friendly technologies. Draft paper, Dept. of Agri. Extn., Annamalai University, Annamalaiagar.
- Epstein, T.S., 1967, *Economic Development and Social Change in South India*. The English Language Book Society and Manchester University Press.

- Erik Van der Werf, 1990, Report on a farmers meeting on transition towards sustainable agriculture, Sorahunase (Bangalore), Agriculture Man Ecology, 20.
- Eshwarappa, G., 1991, An analysis of co-ordination and some management aspects of water shed development programme in Karnataka unpublished. Ph.D. Thesis Submitted to Andhra Pradesh Agricultural University, Rajendra Nagar, Hyderabad.
- Ferguson, G.A., 1966, *Statistical Analysis in Psychology*. Mc Graw Hill Book Company, New York.
- Forster, G.W., 1953, Farm organisation and management. Prentice Hall Inc., New York.
- Francis, C.A. and Youngberg, G., 1990, Sustainable agriculture : An overview, In Sustainable agriculture in temperate zones, Ed. C.A.Francis, C.B. Flora and I.D. King, 1-23, New York, John Wiley and Sons.
- Garrett, H.E. and Wood Worth, R.S., 1967, *Statistics in Psychology and Education*. Vakils, Feffer and Simons Private Ltd., Bombay.
- Gordon, L., 1961, Private Entreprises and International Development. *The Am. Rev.*, **6** (1) : 5-13.
- Gopakumar , K., 1995, The entrepreneur in economic thought : A thematic overview. *The Journal of Entrepreneurship*, **4** (1) : 1-15.
- Gowda, M.J.C., 1996, Sustainability of rice farming in different Eco-systems. *Ph.D. thesis* (Unpub.) UAS, Bangalore.
- Granatstein, D., 1988, Reshaping the Bottom line: On-farm strategies for a sustainable agriculture. Land Sterwerdship Project, Still Water, MN. 55082.
- Grunig, J.E., 1970, Communication and economic decision making process of colombian peasants. *Ecom. Develop. Cul. Change.*, **19** (1) : 580-597.
- Guilford, J.P., 1954, Psychometric methods. Mc Graw Hill Book Company, New York.
- Guilford, J.P., 1956, Fundamental Statistics in Psychology and Education. Mc Graw Hill Book Co., New York.

- Hawley, F.B., 1882, Entrepreneurship. International Encyclopedia of the social sciences, **5**. 1968. pp. 87-90.
- Heredero, J.M., 1979, Agricultural entrepreneurship. Identification and selection of small scale entrepreneurs (ed. Rao, T.V. and and Moulik, T.K.) I.T.I.M., Ahmedabad. pp. 151-159.
- Hess, C.E., 1991, The USDA commitment to sustainable agriculture. In Sustainable agricultural research and education in the field, proceedings on National Research Council, National Academy Press, Washington, pp. 14-18.
- Hirschman, A., 1959, The strategy of economic development New Haven and London. Yale University Press.
- Hoselitz, B.F., 1951, The early history of entrepreneurial theory. *Explorations in entrepreneurial history*, **3** : 193-220.
- Hoselitz, B.F., 1957, Non-economic factors in economic development. In B.C. Tondon (ed.), Environment and Entrepreneur. Chugh Publications, Allahabad. pp. 25-31.
- Hornaday, J.A. and Abond, J., 1971, Characteristics of successful entrepreneurs. *Personal Psychology*, **24** (11) : 141-152.
- Hoods, R.R. and Gupta, V.S., 1995, Sustainable agriculture and development. Haryana Farming, 1-2.
- Hundal, P.S. and Singh, S., 1978, Some correlates of progressive farm behaviour. *J. Occup. Psychol.*, **51** : 327-332.
- Joan Nix, 1992, Wealth creating entrepreneurship, innovating entrepreneurs and new ventures. *The Journal of Entrepreneurship*, **1** (2) : 241-249.
- Joshi, S.S. and Kapur, T.R., 1973, Fundamentals of farm business management. Kalyani Publishers, New Delhi.
- Jones, M.J., 1993, Sustainable agriculture : an appreciation of a concept, crop protection and sustainable agriculture, CIBA Foundation Symposium, 177 , 30-47.
- Khosla and Sunil Puri, 1991, Sustainable agriculture and food security. *Cartman*, **4** (6) : 14.
- Kilby, P., 1971, Entrepreneurship and economic development pree press, New York.

- Lal, R. and Miller, I.P., 1990, Sustainable farming systems for the tropics. Sustainable agriculture issues Perspectives and prospects in Semi-arid tropics, New Delhi. 6-10.
- Lamb, R.K., 1952, The entrepreneur and the community in Men in Business. In C.M. Baumbach and J.R. Man Cuso, (ed.) Entrepreneurship and Venture Management, Prentice Hall Inc., Englewood Cliffs, New Jersey.
- Leo Paul Dana, 1993, Environment for entrepreneurship : A model of public policy and economic development. *The Journal of Entrepreneurship*, **2** (1) : 73-87.
- Leeds, C.A. and Stainton, R.S., 1978, Management and Business studies. MacDonald and Evans. Second Edition.
- Lerner, D., 1964, Literacy and Initiatives in village development. Rural development. Rural development research report, Cambridge Mass : MIT-CIS-Minao Report.
- Lockwood, W.W., 1965, The state and economic enterprises in Japan : Essays in the political economy of growth Princeton University Press, New Jersey.
- Low, M. and Mac Millan, I.C., 1988, Entrepreneurship : Past Research and Future Challenges. *Journal of Management*, **14** (2) : 1-17.
- Marshall, A., 1949, Principles of economic 8th Ed. MacMilan Co., New York.
- McClelland, D.C., 1961, The Achieving Society, Vakils Feffer and Simons Pvt. Ltd., Bombay.
- McClelland, D.C. and Winter, D.G., 1969, Motivating economic achievement. Free Press., New York.
- Mehata, 1975, *Managing Motivation in Education*. Sahitya Mudranalaya, Ahmedabad.
- Minzberg, N., 1976, Techno-economic ecology of corporates strategy. *Journal of Management Studies*, **13** (1) : 62.
- Morrison, D.E., 1962, A conceptual and empirical study in measurement validity, Ph.D. thesis, Madison, University of Wisconsin.

- Moulik, T.K. and Rao, T.V., 1979, Selecting potential Entrepreneurs : An experience. *Identification and selection of small scale Entrepreneurs*. (Ed. Rao, T.V. and Moulik, T.K.) I.I.M., Ahmedabad, pp. 151-159.
- Muniraju, A., 1976, A study of extension participation of farmers in Bangalore district of Karnataka. Unpublished *M.Sc. thesis* in Agril. Extension, University of Agricultural Sciences, Bangalore.
- Nagabhushanam, K., 1997, Sustainability of agriculture in watershed environment-An analysis. Unpublished Ph.D. Thesis, Submitted to Tamil Nadu Agricultural University, Coimbatore.
- Nandapurkar, G.G., 1980, A study on entrepreneurial behaviour of small farmers. Unpublished Ph.D. thesis submitted to University of Agricultural Sciences, Bangalore.
- Narayana Swamy, B.K., 1995, Management services for small farmers development, Unpublished *Ph.D. thesis* in Agril. Extension, UAS, Bangalore.
- Narayana Swamy, B.K., 1996, Small farmers development : Co-operative as a desirable model. Paper presented in the seminar on re-discovering co-operation held during November. 19-21, 1996 at IRMA, Anand.
- Nasser Ahmed and Kakoty, H.N., 1993, Determinants of Agricultural Entrepreneurial success. *Indian J. Soc. Res.*, **34** (3) : 251-255.
- Pareek, U. and Nadkarni, M., 1978, Development of Entrepreneurship A conceptual Model. *Developing Entrepreneurship : A Hand Book* (Ed. Rao, T.V. and Pareek, U.) Learning systems, New Delhi. pp. 29-41.
- Patel, M.M., 1995, Role of entrepreneurship in agricultural development. *Kurukshetra*, XLIII (12) : 41-44.
- Pookpakdi, A., 1993, Sustainable agriculture development with emphasis on small farmers : Interaction of socio economic consideration. *Farm management notes for Asia and East*, **16** : 1-15.
- Porchezian, M.R., Vijayaraghavan, R., Baby Kumari, P. and Suseela Mary, T., 1998, Entrepreneurial Behaviour of farmers. *Indian J. Extn. Educ.*, **9** (1) : 1963-1964.

- Prasad, M.S. and Mahipal, 1991, Technological gap and constraints in adoption of sorghum cultivation in dryland agriculture. *Mah. J. of Extn. Educ.*, **10** (1) : 31-40.
- Ramakrishna, K., 1979, Interview techniques as a method of selection. Identification and selection of small scale entrepreneurs. (Ed. Rao, T.V. and Moulik, T.K.) I.T.M., Ahmedabad. pp. 88-93.
- Rao, T.V. and Moulik, T.K., 1979, Identification and selection of small scale entrepreneurs. I.T.M., Ahmedabad. pp. 1-31.
- Ranade, S.P., 1996, Entrepreneurship development for model of 21st century : A short note. *Small Enterprises Development Management of Extension*, **23** (2) : 47-48.
- Ranganatha, A.D., 1996, A study on knowledge and adoption of organic farming practices among rice farmers. Unpublished M.Sc. thesis in Agril. Extension, University of Agricultural Sciences, Bangalore.
- Rathakrishnan, T.V., Ravichandran, V., Ravi, K.C. and Jeyakumar, K.A., 1997, Adoption and constraints on green gram cultivation practices. *Journal of Extension Education, Society of Extension Education*, Tamil Nadu Agricultural University Campus, Coimbatore.
- Ray, R.W., 1990, Defining and using the concept of sustainable agriculture. *J. Agron. Educ.*, **19** (2) : 126-130.
- Redlich, F., 1949, The business leader in theory and reliability. *American J. Econ. Soc.*, **86** : 223-224.
- Rogers, E.M. and Svenning, L., 1969, Modernization among Peasants. The Impact of communication olt, Rinehart and Winston, Inc. New York.
- Roy, P. and Iyer, R.B., 1967, Measuring functional literacy in Indian Villages. *Behavioural Sciences and Community Development*, **1** (2) : 107-113.
- Ruttan, V.W., 1989, Sustainability is not enough. Better crops with plant food, spring : 6-9. Potash and Phosphate Institute, Atlanta, G.A.
- Schumpeter, J.A., 1947, The creative response in economic history. *J. Econ. History*, **7** : 149-159.

- Sethy, B., Sinha, B.P. and Bahal, R., 1984, Some entrepreneurial characteristics in adoption of an improved farm technology. *Indian J. of Extn. Educ.*, **20** (1 & 2) : 29-37.
- Selvanayakam, D., 1998, Entrepreneurship and creativity. *The Journal of Small Enterprises Development Management of Extension*, **25** (1) : 11-19.
- Sharma, P.C., 1970, Socio-psychological variables influencing social change and economic development. *Indian J. of Soc. Res.*, **11** (3) : 333-344.
- Sinha, B.P. and Mehta, P., 1972, Size of land holding and farmers achievement motivation and change proneness. *Behavioural Science Community Development*, **6** (2) : 244-251.
- Singh, N.P., 1969, A study of the relationship between anxiety and risk taking amongst successful and unsuccessful agricultural entrepreneurs of Delhi. *Manas*. **15** (2) : 111-119.
- Singh, N.P., 1970, Achievement motivation among agricultural and business entrepreneurs of Delhi. *J. Soc. Psychol.*, **81** : 146-149.
- Singh, N.P. and Singh, K., 1971, Motivational components of Entrepreneurs. *Indian J. Industrial Relation*, **7** (1) : 35-52.
- Singh, S., 1978, Achievement motivation decision making, orientation and work values of fast and slow progressing farmers in India. *The J. Soc. Psychol.*, **106** : 153-160.
- Singh, R.P. Das, S.K., Bhaskar Rao, U.M. and Reddy, M.N., 1990, Towards sustainable dryland practices. CRIDA Santoshnagar, Hyderabad, India.
- Singh, S.P. and Laharia, S.N., 1992, Constraints in transfer of sugarcane technology. *Indian J. of Extn. Educ.*, **28** (1 & 2) : 65-70.
- Swaminathan, M.S., 1989, Ensuring Ecological Security. The Hindu : Survey of Indian Agriculture : 18.
- Sundar, D.L. and Kamalanabhan, T.J., 1997, Entrepreneurial risk taking. *Small Enterprises Development Management of Extension*, **24** (3) : 1-9.
- Tandon, B.C., 1975, Environment and Entrepreneur. Chugh Publications , Allahabad.

- Timmons, J.A., 1989, Entrepreneurial mind (Andover, M.A. : Brick House Publishers).
- Trivedi, G., 1963, Socio-economic status scale, Unpublished Ph.D. thesis in Agricultural Extension, I.A.R.I., New Delhi.
- Udai Pareek, 1994, Entrepreneurial role stress. *The Journal of Entrepreneurship*, **3** (1) : 55-67.
- Udai Pareek and Rao, T.V., 1995, Counseling and helping entrepreneurs. *The Journal of Entrepreneurship*, **4** (1) : 19-37.
- Uplankar, A.T., 1977, A study of self employed industrial entrepreneurs. *The Indian Journal of Social Work*, **38** (2) : 137-147.
- Venkata Ramaiah, P., 1993, Entrepreneurial behaviour of small farmers. *Indian J. of Extn. Educ.*, **29** (3 & 4) : 89-91.
- Wharton, C.J. Jr., 1966, Modernising subsistence agriculture. In D.C. McClelland and Winter (Ed.), *Motivating Economic Achievement*. The Free Press, New York. pp. 5-7.
- Waghdhare, K.W. and Wakde, W.T., 1989, Factors responsible for the entrepreneurial skill of the farmers. *Maharashtra J. of Extension Education*, **8** : 221-224.
- Young, A., 1991, Agro forestry, Agriculture and sustainability outlook on Agriculture. *Agro forestry Abstracts*, **4** (1) : 43.

APPENDICES

APPENDIX I

Telex : 0845-8393-UASK-IN
Fax : 0091-80-333 4804
333 0277

Grams : "UNIVAGRIS"
Phone : 333 7556
333 1483

UNIVERSITY OF AGRICULTURAL SCIENCES, BANGALORE

Dr. B.K.NARAYANA SWAMY
B.Sc. (Agri.), M.Sc. (Extn.)
Ph.D. (Agricultural Extension)
Associate Professor

Staff Training Unit
Director of Extension
Hebbal, Bangalore-560024
INDIA.
Date : 1-12-1997

Dear Sir,

I am glad to know that you and your organisation is interested in development of sustainable agriculture. This University is now interested to take up a comprehensive research on "Entrepreneurial behaviour of farmers practicing sustainable agriculture" which will be carried out by Mr. N. Nomesh Kumar, post graduate student, Department of Agricultural Extension for his M.Sc. programme. Hence, there is need to standardize the sustainable practices adopted by farmers.

Looking to your vast experience, expertise and academic excellence you have been identified as one of the judges to standardize the sustainable agriculture practices. I am enclosing herewith appendix I & II with list of sustainable agriculture practices. May I request you to mark (✓) in one of the columns provided against each sustainable practice. If you feel like adding few more items kindly list them. I request you to spare some time from your busy schedule and help in this research work by giving your valuable opinion. Kindly handover the completed schedule to Mr. N. Nomesh Kumar. Your valued co-operation shall be highly appreciated.

With regards

Yours Sincerely

To

Sd-

(B.K. Narayana Swamy)

ANNEXURE I

140

Sl No.	Sustainable agriculture practice	Most Relevant	Relevant	Not Relevant
1.	Organic farming			
2.	Agro forestry			
3.	Intergrated farming			
4.	Biodynamic farming			
5.	Natural farming			
6.	Integrated pest management			
7.	Integrated nutrient management			
8.	Bio-fertilizer use			
9.	Soil and water conservation			
10.	Other practices			
11.				
12.				
13.				

ANNEXURE II

I	Organic Farming
a.	Following crop rotation
b.	Using crop residues
c.	Using animal manures
d.	Growing leguminous crops
e.	Using green manures
f.	Using farm organic wastes
g.	Mechanical cultivation
h.	Using mineral bearing rocks
i.	Biological control
j.	Any other
k.	
l.	
II.	Agro-forestry
a.	Growing trees and crops as multiple cropping
b.	Growing trees and crops as intercropping
c.	Multistoried agroforestry
d.	Alley cropping system
e.	Hedge forest system
f.	Growing trees on bunds
g.	Growing crops, trees and animals in temporal sequence
h.	Any other
i.	
j.	
k.	

III Integrated Farming

- a. Growing crops and animals
- b. Silk worm and dairy animals
- c. Fish culture in paddy fields
- d. Duck farming in paddy fields
- e. Poultry and fish farming
- f. Piggery and fish farming
- g. Growing trees and animals
- h. Animal power for cultivation
- i. Any other
- j.

IV Biodynamic farming

- a. Using Cow-horn manure
- b. Using Horn - Silica
- c. Using yarrow
- d. Using chamomile
- e. Using stinging nettle
- f. Using oak bark
- g. Using Dandelion
- h. Using valerian
- i. Any other
- j.
- k.
- l.

V Natural Farming

- a. Zero tillage
- b. No weeding, thinning etc.
- c. No chemical fertilizers
- d. No pesticides
- e. No intercultural operations
- f. No irrigation
- g. No alteration to plant and soil
- h. No manures
- i. Any other
- j.

VI Integrated Pest Management

- a. Using cultural methods
- b. Using mechanical methods
- c. Using biological methods
- d. Using physical methods
- e. Using chemical methods
- f. Using genetic methods
- g. Using regulatory methods
- h. Any other
- i.
- j.

VII Integrated Nutrient Management

- a. Using organic manure
 - b. Using mineral bearing rocks
 - c. Using animal manures
 - d. Using chemical fertilizers
 - e. Using off farm wastes
 - f. Hand weeding
 - g. Using crop residues
 - h. Intercropping system
 - i. Any other
 - j.
-

VIII Bio-fertilizer

- a. Rhizobium
 - b. Azotobacter
 - c. Mycorrhiza
 - d. Bluegreen algae
 - e. Azolla
 - f. Azospirillum
 - g. Phosphobacteria
 - h. Phosphate releasing fungi
 - i. Any other
 - j.
 - k.
 - l.
-

IX Soil and Water conservation

- a. In-situ moisture conservation
 - b. Off season and early tillage
 - c. Contour bunding
 - d. Graded bunding
 - e. Nala bunding
 - f. Crescent bunding
 - g. Surface farm pond
 - h. Earthen dams
 - i. Catch pits
 - j. Check dam
 - k. Percolation tank
 - l. Any other
-

ENTREPRENEURIAL BEHAVIOUR OF FARMERS PRACTICING SUSTAINABLE AGRICULTURE

(INTERVIEW SCHEDULE)

Sl No of respondent	
----------------------------	--

Date : Dec 2, 1997

1. Name of the farmer : _____

2. Age : _____

3. Education a) Illiterate b) Can read and write
 c) Primary d) Middle school
 e) Matriculate f) College

4. Size of the family	:	Adults	Children	Total
		Male	Male	
		Female	Female	
		Grand Total		

5. Size of the farm :
 Dry _____ acres, wet _____ acres, garden _____ acres, Total _____ acres

6. Source of irrigation :
 Well _____ acres, Canal _____ acres, others _____ acres, Total _____ acres

7. Occupation of the family head :
 a) Agriculture b) Employment c) part time employment
 d) Business e) any others (specify) _____

8. (a) Whether farmer is a member of any organisation. Yes/No
 (b) If yes, please list them.

	Name of the organisation	Member
a	Mandal panchayat	
b	Taluk panchayat	
c	Zilla panchayat	
d	Youth club	
e	Co-operative society	
f	Self help groups	
g	Any others	

9. Livestock position of farmer :

No.	Bullocks	Cows		Buffaloes	Sheep & Goat	Poultry	Others
		Local	CB				

10. Crops grown during last Year

Season	Crop	Variety	Acres	Yield in Kg/Ac	Previous crop	Adopted sustainable practice (Yes / No)
--------	------	---------	-------	-------------------	------------------	--

Kharif**Rabi****Summer****Perennial
crops**

11. a) Have you adopted any of the following sustainable agriculture practices
b) If yes, list them.

Yes/No

	Sustainable practice	Year of adoption	Name of the crop	Area in acres
a.	Organic Farming			
b.	Integrated Farming			
c.	Integrated Pest Management			
d.	Integrated Nutrient Management			
e.	Agro-forestry			
f.	Soil and Water conservation			
g.	Bio-fertilizer use			

12. Have you faced any constraints in adoption of sustainable practices

(Yes / No)

(Sustainable refers to some of the lacunae which hinder the adoption of sustainable agriculture practices).

A. Technological constraints : It refers to some of the lacunae in the recommended organic agriculture technologies like inappropriateness, complex nature, non-practicable etc.

- a) _____
b) _____
c) _____

B. Service and supply constraints : Constraints related to the non- availability of inputs for adoption of sustainable agriculture etc.

- a) _____
b) _____
c) _____

C. Infrastructural constraints : Constraints related to inadequate sale points of inputs, long distance to reach to get inputs, non- availability of timely and adequate inputs, inefficient quality control etc.

- a) _____
b) _____
c) _____

D. Personal constraints : Constraints related to individual like age, education, knowledge level, exposure etc.

- a) _____
b) _____
c) _____

E. Socio psychological constraints : Constraints related to lack of conviction, avoidance in risk taking, lack of awareness, lack of beliefs, skepticism, lack of aspiration, lack of community action etc.

- a) _____
- b) _____
- c) _____

F. Information transfer constraints : Constraints related to people to get the technology in time through participation etc .

- a) _____
- b) _____
- c) _____

G. Situational constraints : Constraints related to problematic soils, disease and pests in endemic areas, food requirement of the country etc.

- a) _____
- b) _____
- c) _____

H. Operational constraints : Constraints related to production with operation of technologies like size of land holdings etc.

- a) _____
- b) _____
- c) _____

I. Organisational constraints : Constraints related to short comings of various organisations and institutions like non-availability of extension workers, staffing pattern etc.

- a) _____
- b) _____
- c) _____

J. Economic constraints : Constraints related to non-availability of credit, insufficient capital, more interest rate on loan, low profitability, high cost of production etc.

- a) _____
- b) _____
- c) _____

K. Policy constraints : Constraints related to policy of Government with respect to support price for produce, levies, crop insurance etc.

- a) _____
- b) _____
- c) _____

L. Adhoc constraints : Sudden disease out break, pest out break etc. 147

- a) _____
b) _____
c) _____

13. Extension participation

Extension activities	Number of times attended	on what aspects (name one)	Not attended
a Training programmes			
b Field days			
c Field visit			
d Agriculture tours			
e Exhibitions			
f Demonstrations			
g Others			

14. Mass media participation

- A. a) Do you listen/ see farm agricultural programmes on Radio/TV **Yes / No**
b) If yes, how often do you listen / see
Regular / sometime / rarely
c) Name one programme recently listen / seen

- B. a) Do you read or get read printed material relating to agriculture or allied subjects **Yes / No**
b) If yes, what type ?
News paper / farm periodicals / leaf lets / pamphlets
c) How often do you read / get read ?
regular / sometime / rarely
d) Name one printed material recently read / get read

15. Innovativeness

Following are some of the innovations introduced. Kindly tell me, when did you adopt them.

Innovations	Specify the item/ type/ variety/ breed	Adopted since how many year	Not adopted
a)	Organic pesticides		
b)	Vermiculture		
c)	Biogas plant		
d)	Hy.varieties		
e)	Crossbred cows		

16. Decision making ability :

Farmer has to take decisions at various stages of sustainable farming enterprise. Please tell me what type of decision you have taken at each and every stage of the following activities. If you have taken decision, please indicate whether decision taken on your own or in consultation with others ?

Decision criteria	Not considered	Considered after consultation with others	Considered independently
a To try sustainable practice			
b To increase/decrease crop area			
c To switch to new cropping plan			
d To hire farm labour			
e To borrow loan for the farm work			
f To buy farm equipment			
g To attend agriculture meeting			
h To try new varieties of crops			
I To choose kind of practice			
j To subscribe farm publications			

17. Achievement motivations (n -Ach)

Every man has a desire to achieve the things in his life. Incomplete sentences pertaining to desire of excellence are given here to do something well for its own sake rather to gain power, love or recognition. Kindly complete the following sentences.

- a) A farmer adopted sustainable agriculture to day should _____

- b) A good organic agriculture farmer _____

- c) If I had the worst farm in this area _____

- d) The ideal man _____

- e) I felt most dissatisfied when _____

- f) Most of all I want _____

- g) I used to day dream about _____

18. Information seeking ability

Among number of information sources listed below, kindly indicate whom do you contact for getting information pertaining to adoption of sustainable farming practices. Your, more or less frequent contact is to be informed.

Information source	Never	Less frequently	More frequently
a Neighbours/relatives /friends			
b Sustainable agriculture farmers			
c News paper/ leaflet			
d Radio/ Television			
e Extension worker/ NGO			
f Demonstration/Field day			
g Training programmes			

19. Risk taking ability

Some farmers take more risk, some others take moderate risk and more hesitate to take risk because sustainable farming is a risky business. The following statements formed based on ability to take risk. I request you kindly to give your opinion about the statement.

- A. i) Are you using only organic manure in agriculture **Yes / No**
 ii) If yes, name the crop grown and type of organic manure used during last year

Name of the crop	Type of organic manure used
a)	
b)	
c)	

- B. i) Do you use organic pesticides for vegetable crops ? **Yes / No**
 ii) If yes give details

Name of the crop	Organic pesticide used
a)	
b)	
c)	

- C. i) Have you taken loan for farm improvement **Yes / No**
 ii) If not do you want to take it now ? **Yes / No**

- D. i) Have you adopted any sustainable farming practice or any new variety of crop for the first time in your village. **Yes / No**
 ii) If yes, give details.
 a)
 b)
 c)

- E. i) Have you stopped growing any crop due to price going down **Yes / No**
 ii) If not what crops you grow inspite of price fluctuation
 a)
 b)
 c)

- F. i) Do you grow more than one crop on your rainfed areas ? **Yes / No**
 ii) If yes, give details

First crop	Second crop
a)	
b)	
c)	

- G. i) Are you willing to try new sustainable practice when you heard about it over
Radio/ Seen in TV/ Read it in newspaper **Yes / No**
ii) If yes, please give one or two examples.
a)
b)
c)

20. Co-ordinating ability

In order to complete the required work in stipulated period, farmer has to harmonize and synchronise the various farm activities for better farming business. I request you kindly to respond.

- i) Last year did you prepare organic farming cropping plan well in advance ?
a) prepared well in advance ()
b) prepared at the nick of the time ()
c) plan was not prepared ()
- ii) Did you estimate money required for cropping during last season, well in advance ?
a) Estimate was made well in advance ()
b) Estimation was made at the nick of the time ()
c) Estimation was not made ()
- iii) Last season did you procure seeds of HYV, well in advance
a) Procured well in advance ()
b) Procured at the nick of the time ()
c) Did not procure ()
- iv) During last year did you arrange for organic manure and organic pesticides well in advance
a) Arranged well in advance ()
b) Arranged at the nick of the time ()
c) Did not arrange ()
- v) Did you consult extension worker of Govt./ NGO or specialist when you heard about incidence of pest attack on the crop in the village ?
a) Discussed as soon as incidence was heard ()
b) Discussed at the lapse of one week ()
c) Never discussed ()

21. Leadership ability

To get the things done properly, farmer has to initiate the action, motivate the followers and decision should be taken. Some statements related to leadership ability are given here. Please indicate the response.

- a. Do you offer new approaches to solve problems in sustainable agriculture ? **(Yes/Never)**
Always/Sometime
- b. Do village people regard you as a good source of information on sustainable farm practices ? **(Yes/Never)**
Always/Sometime
- c. Whenever you see a new sustainable farm practice did you initiate discussion about it with your colleagues ? **(Yes/Never)**
Always/Sometime
- d. Do you assign the organic farming work to your family members/ farm labourers ? **(Yes/Never)**
Always/Sometime
- e. Did you participate in discussion on sustainable farm practices in the group meeting or in peer group ? **(Yes/Never)**
Always/Sometime

APPENDIX III**NAME AND ADDRESS OF JUDGES USED FOR THE STUDY**

1. Mr. Agarwal, R.K.
Principal Scientist, Central Arid zone
Research Institute, Jodhpur,
Rajasthan, India
2. Dr. Aht Boonnitee,
Sekai Kyusci Kyo, 20/1 Soi Sifa,
Phahonyothin Road, Bangkok,
Thailand
3. Mr. Ashraf Udin
Senior Researcher
UBINIG (Policy Research for Development Alternative),
5/3 Barabo Mahanpur, Ring Road,
Shaymoli, Dhaka -1207,
Bangladesh
4. Mr. Atar Singh
Scientist (SS), Agronomy Crop Production Division,
Indian Grassland of Fodder Research Institute,
Jhansi, Uttar Pradesh, India
5. Mr. Atsuo Fujii
Japan Organic Natural Foods Association,
Aomori-Ken Bus, Plaza, Sumitomo Bldg.
5F, 2-2-1, Yaesu,
Japan.
6. Mr. Banerjee, M.K.
Rtd. Entomologist,
429/3, Ashoknagar, North 24,
Paraganas, -West Bengal, India .
7. Mr. Basanta Rana Bhat
Community Development Officer
Ecological Services Centre, P.O.Box
04, Narayangarh Ilaka, Chitwan, Nepal,
8. Mr. Bipul Sharma
Directorate of Extension
AAU Jorhat, Assam,
India

9. Mr. Bo Van Elzakker
Agro Eco Consultancy, P.O.Box, 176,
3970 AD Driebergen,
Netherlands,
10. Mr. Edgard Guevara
President Geo Farm Barrio Mangayao,
Bayambang, Pangasinan,
Philippines
11. Ms. Eva Cadenas,
Programmes and Services Dep. Manager,
Alter Trade Corporation, Block 6-A,
Lily Street, Bata subdivision, Bacalod City,
Philippines
12. Dr. Emanuel S. Mahandrarajah
Director, Gnanammah Integrated Research Farm,
7/4 King's Street, Matale,
Sri Lanka.
13. Mrs. Farzana Hussain Panhwar
President, Sindh Rural Women's Uplift Group,
157-C, Unit No. 2 Latifabad,
Hyderabad (Sindh),
Pakistan,
14. Mr. Herve La Prairie,
President, IFOAM, Nenehy Bihan,
F-29460 Daoulos, France
15. Ms. Ho Woon Ming
MOFAN - Malaysian Organic Farming Network,
P. Box 382, 46740, Petaling Java,
Malaysia,
16. Mr. Hartmann Heinrch,
Project Advisory Service, AGEH,
Hirschberger Strasse 56,
53119, Bonn, Germany
17. Mr. Hideto Kawakita
Radix / Nippon Ecology Network, 3-Banchi,
Fukuro-Marchi, Shinjyuku-ku, Tokyo -162,
Japan.

18. Dr. B. Jacob
Director
Synergy Systems 0549 IVth Floor,
GCCA Complex, Cochin, Kerala
India.
19. Mr. Jin Young Jung
Korea Organic Farmers Association
3rd Fl. No., 98, 600 Garak Dong,
Songapagu 138-701 Seoul,
Korea
20. Mrs. Juliet Abunyawon
Man. Director, Sariling Sikap,
Inc. 105 Scout Rallos St., Kamuning,
Quezon City, Philippines,
21. Mr. Jyant Barve
Sustainable Agri. Research Institute,
Sangli, Maharashtra,
India
22. Mr. Katsumi Noda,
Daichi-wo-Mamoru-Kai,
2-15-3 Shiohama Ichikawa City,
Chiba 272-0197,
Japan
23. Mr. Kazuyoshi Fujita
Daichi-wo-Mamoru-Kai,
2-15-3 Shiohama Ichikawa City,
Chiba 272-0197,
Japan
24. Mr. Kokichi Itoh,
Yonezawa Bokujo Farm,
National Organic Producers Association,
2713 Oaza Hongo, Tkahata -machi,
Higashi-Okitama-gun, Yamagata Pref.
Japan.
25. Mr. Krittanand Dowlutra
Executive Chairman, Indian Ocean
Agro-Ecology Network, 11 Royal St.
Mont- Ida, Mauritius

26. Mr. Kwang Ha Lee,
Assistant Manager, NAPIO
433-2 Anyabg 6 Dong, Anyang city,
Kynggido, Korea
27. Mr. Lawrence Chua,
Pureland Organic Health Farm, 50,
Chin Swee Rd # 10-06 Thong Chai Bldg.,
Singapore
28. Dr. Li Zhengfang
Director, OFDC of China 8,
Jiangwangalao Street,
Nanjing China.
29. Dr. Lu Zhen-hui
Head, R&D Division, Tea Research Institute
Chinese Aca. Of Agricultural Sciences,
Yungi Road 1, Hangzhou 310008 Zhejiang P.R.
China
30. Mr. Maheswar Ghimire
Executive Director
Ecological Service Centre
P.O.Box : 04, Narayangarh, Chitwan,
Nepal
31. Mr. Michiaki Tokue
Radix / Nippon Ecology Network, 3-Banchi,
Fukuro-Marchi, Shinjyuku-ku, Tokyo -162,
Japan.
32. Mr. NAPIO
433-2 Anyabg 6 Dong,
Anyang city, Kynggido,
Korea
33. Mr. Ong Kung Wai
Sustainable Agri-programme Officer,
Pesticide Action Network - Asia and The Pacific,
P.O.Box. : 1170, 10850, Penang,
Malaysia.
34. Dr. Rach Rujirawath,
Sekai, Phahonyothin Road,
Bangkok, Thailand

35. Mr. Rey C. Canunayon,
Head, Education and Formation Dept.,
sustainable Agri. Centre Xavier
University College of Agriculture,
Complex. P.O. Box. 89 9000, Cagayan De Oro city,
Philippines
36. Mr. Rohini Weerasinghe
Kautha Sakthi
C/o Gami Seva Sevana, Galaha,
Sri. Lanka.
37. Mr. Rogelio Bantiles
President, AVDF-Alliance of Volunteers in Dev.
Foundation Inc. 22 Magiting Street,
Teacher's Village, Diliman Quezon City,
Philippines.
38. Mrs. Rossana Dewi. R
Chief Executive Director,
GITA PERTIWI Griyan Lama No. 20 Rt. 01/RwI
Baturan-SOLO 57171
Indonesia
39. Mr. Rupela. O.P.
ICRISAT, Hyderabad,
Andhra Pradesh, India
40. Dr. M.K. Sethu Rao
Rtd. Director of Extension
UAS, Hebbal, Bangalore, India.
41. Mr. Sinnamalu we Manage De Silva
Sumanaseva, Adms. Officer
Saviya Development Foundation
24/A, Wewelwala Road, Galle,
Sri Lanka
42. Mr. Sri Niriyati
Konphalindo, Jalan Teluk Jakarta
No. 1, Komplek TNI -AL, Rawa Bambu,
Pasar Minggu-Jakarta Selatan 12520
Indonesia
43. Mr. Subash C. Biswas
Agriculture Co-ordinator,
Forum of Regenerative Agriculture Movement (FORAM),
59 A Satmasjid Road, Dhanmandi R/A.
Dhaka 1209, Bangladesh

44. Dr. M.S. Swaminathan
M.S.S. Foundation
Chennai, India
45. Mr. Syed Asad Hussain
President, Pakistan Organic Farmers Association,
76 West Wood Colony, P.O. Niaz Beg,
Lahore - 53700,
Pakistan
46. Ms. Tan Hwee Noi
Coordinator, MOFAN - Malaysian
Organic Farming Network,
P. Box. 382, 46740, Petaling Java,
Malaysia
47. Mr. Tomoaki Noda
Daichi-wo-Mamoru-Kai,
2-15-3 Shiohama Ichikawa City,
Chiba 272-0197, Japan
48. Mr. Tunejai Deetes
Hill Area Development Foundation
222MOO 16 Pa-Ngiw Rd. Soi 3
Robwiang A.Muang, Chiangrai,
Thailand
49. Mr. Vic. I. Tagupa
Sustainable Agriculture Centre
Xavier University College of Agri.,
Home Add : Block 31/Lot 12, Xavier compound,
Xavier Heights, Upper balulang,
9000cagayan de Oro city, Philippines
50. Mr. Vaheesan Saminathan
Consultant, Gami Seva Sevana
Office Junction, Galaha,
Sri Lanka
51. Ms. Yuen Yee Lau
Farm Manager, Produce Green
18 Hok Tau Village, Fanling,
Hong Kong
52. Mr. Zhang Wenjin
Vice Director
Panjin Foreign Affairs Office,
Liaoning Province, P.R. China.

NAME AND ADDRESS OF FARMERS USED FOR THE STUDY

1. Mr. N. Arun
Kanivemane
Amtekuppa Post, Shikaripura Taluk,
Shimoga District, Karnataka State
2. Mr. Anil Gupta
205, Anurag Complex, R.C. Dutt Road,
Baroda, Gujarat State
3. Mr. Amrutlal Budhabhal
Gramabharathi Amrapur, Kalol Taluk,
Mehsana District, Gujarat State
4. Mr. Anant Gogte
Gram Vardhini, 17, Vidya Vilas Colony,
ITI Road, Pune, Maharashtra State
5. Mr. Anant Ram
Ramiol, Jayarabad taluk,
Medhak District,
Andhra Pradesh State
6. Mr. Anki Reddy. S.
Dharani Forestry and Orchids,
Guntur, Andhra Pradesh State
7. Mr. Basavaraju. B
Santheshivara Village,
Channrayanpatna, Hassan District,
Karnataka State
8. Mr. Basavaraj, K.H.
S/o K.H. Halingappa
Kalkere, Kalkere Post
Turuvekere Taluk
Tumkur, Karnataka State
9. Mr. Bylappa, M.B.
S/o Basappa. M.B.
Mudugere, Upparahalli post
Gouribidanur Taluk,
Kolar, Karnataka State

10. Mr. Badraibhai Joshi
Santigram Nirman Mandal
Tanchha Post, Amod Taluk,
Bharuchi District, Gujarat State
11. Mr. Bipin Chandra Suyal
Suyal Garh
Simrar post, Nainital District,
Uttar Pradesh state
12. Mr. Birendra Singh Bisht
Padampur Deolia
Motahaldur post,
Haldwani, Nainital,
Uttar Pradesh
13. Mr. Bharama Gowda
Yalavatti, Sira hatti taluk,
Gadag District, Karnataka State
14. Mr. Dhattal. U.D.
Jaipur Bisa, Motahaldur Post,
Nainital District, Uttar Pradesh State
15. Mr. Hegde. S.N.
Ademane, Heepanahalli Post,
Sirsi, Uttara Kannada,
Karnataka State
16. Mr. Jalan Sajan
Rajanagar, Chhadni,
Nagpur, Maharashtra state
17. Mr. James Abraham
Kottyam, Kerala state
18. Mr. John Jo Varghese
Peermade, Iddukki District,
Kerala State
19. Mr. Kamraj.K.
Vidiyal, Kariappaipatti
Rasingapuram, Thensi Distrcit.
Chennai State
20. Mr. Karri Jogi Naidu
Thummapala, Anakapalle Vishaka,
Andhra Pradesh State

21. Mr. Kennedy. J.
Nawab Thottam, Coimbatore,
Chennai State
22. Mrs. Kirti Pradeep
4th Floor, Mehreen, Chittoor Road,
Kochi, Kerala State
23. Mr. Keshavamurthy. M.S.
Sonashettyhalli, Chitamani Taluk,
Kolar District, Karnataka State
24. Mr. Krishan Dev Singh
Janpryas, Paniyra Kaitholi,
Mau District, Uttar Pradesh State
25. Mr. Mariaselvam. P.
Nizam Colony, Pudukottai,
Chennai State
26. Mr. Mathew P. John
Peermade, Idukki District,
Kerala State
27. Mr. Mutatkar. V.K.
103, Uday Bldg. Sector-15, Vashi Navi,
Mumbai, Maharashtra State
28. Mr. Mohan Chandra Kavidayal
Motahaldur Post, Haldwani,
Nainital district, Uttar Pradesh State
29. Mr. Mutahalli Desai. A.T.
203, Shukrawar Pet
Tilakwadi Taluk, Belgaum District,
Karnataka State
30. Mr. Nazareth. J.J.
New Gayathri Mandi, Juna Wadaj,
Ahmedabad, Gujarat State
31. Mr. Omprakash Mor
Yavatmal, Maharashtra State
32. Mr. Papanasam Sankranainar
Sarmajee Road,
Kallidaikurchi, Tirunelveli,
Chennai State

33. Mr. Pramod Kadam
258, Ram nagar
Nagpur, Maharashtra State
34. Mr. Pramod. K.
U41, Narendra Nagar,
Nagpur, Maharashtra State
35. Mr. Patil. R.M.
Chairman, BIRDS KUK
Tukkanatti, Gokaka taluk,
Belgaum District, Karnataka State
36. Mr. Ravindra. M.V.
Chillahally,
Abbinahole post,
Hiriyur Taluk, Chitradurga District,
Karnataka State
37. Mr. Raju. T.
Royar thoppu, Koothur,
Trichy, Chennai State
38. Mr. Raju Joseph,
Veerchurettu, Ettumanoor,
Kerala State
39. Mr. Ramanna
Ganapathipuram, Udumalpet,
Chennai State
40. Mr. Ramesh kumar. S.S
Gynapuram Nandyal,
Kurnool, Andhra Pradesh
41. Mrs. Radha Bai Kalyan Shelkae
Tondoli, Dhupkhedi, Paiton Taluk,
Aurangabad District, Maharashtra
42. Mr. Rambhau Shirode
4/B, Jeevan Deep Building,
21, Nikadwari Lane
S.V. Sovani Path Girgaum,
Mumbai, Maharashtra State
43. Mrs. Rajeshwari. K.
North Street, Pasupathi kovil Post,
Tanjore District,
Chennai State

44. Mr. Sankaran Kutty. K.R.
Karqaamakal, Chazoor,
Thrissur, Kerala State
45. Mrs. Saraswathi Devi Karri
Thumpala Street,
Anakapalle Mandal, Visakha,
Andhra Pradesh State
46. Mrs. Satya Jothi
78, A, Chittivinayakar colony,
Vadavalli, Coimbatore,
Chennai State
47. Mr. M.C. Sharma
Auzjumpur, Nainital,
Uttar Pradesh State
48. Mr. Sekhar Rao. B
Paigah Plaza, Basheer Bagh,
Hyderabad, Andhra Pradesh
49. Mr. Singh. R.D.
Vivekananda Parvatiya,
Krishi Anusandhan Shala,
Almora, Uttar Pradesh State
50. Mr. Shirode. R.D.
Girgaum, Mumbai,
Maharashtra State
51. Mr. Sithapathi Rao
Saifa bad, Hyderabad
Andhra Pradesh State
52. Mr. Sivakumar. S.
SD Road, Secunderabad,
Andhra Pradesh State
53. Mr. M.C. Suyal
Gaga Rambur, Motahaldu post,
Nainital District,
Uttar Pradesh State
54. Mr. Surendra Singh Jina
Jina Farm, Motahaldu
Nainital, Uttar Pradesh State

55. Mr. Shiv Bahadur Singh
Karnatak Book Depot,
Shader Bazar, Haldwani,
Nainital, Uttar Pradesh State
56. Mr. Uday Singh Amirsingh Raj
Manad Post, Bharuch Taluk,
Bharuch District,
Gujarat State
57. Mr. Venkateshwaralu. B.
CRIDA, Santoshnagar, Hyderabad,
Andhra Pradesh State
58. Mrs. Vijayalakshmi. C.K.
Chundale, Wynad,
Kerala State
59. Mr. Vijay Uttarwar
Nisarga Sadhana, Saraswat Chowk
Yavatmal, Maharashtra State
60. Mrs. Yamunabhai
Beedkin Post, Bamgala Tanda,
Paithan Taluk
Aurangabad District,
Maharashtra State

APPENDIX V

ENTREPRENEURIAL BEHAVIOURAL SCALE

Innovativeness

Following are some of the innovations introduced. Kindly tell me, when did you adopt them ?

Innovations	Not adopted	Maximum score 30						scale value	
		Adopted since how many years						8.83	
		(6)	(5)	(4)	(3)	(2)	(1)		

Organic pesticides

Vermiculture

Biogas plant

Hybrid varieties

Crossbred cows

Decision making ability :	Maximum score	Scale value
	20	8.62

Farmer has to take decisions at various stages of sustainable farming enterprise. Please tell me what type of decision you have taken at each and every stage of the following activities. If you have taken decision, please indicate whether decision taken on your own or in consultation with others ? (Scoring not considered = 0, considered, after consultation with others = 1, considered independently = 2)

Decision criteria	Not considered	Considered after consultation with others	Considered independently
1. To try sustainable practice			
2. To increase/decrease crop area			
3. To switch to new cropping plan			
4. To hire farm labour			
5. To borrow loan for the farm work			
6. To buy farm equipment			
7. To attend agriculture meeting			
8. To try new varieties of crops			
9. To choose kind of practice			
10. To subscribe for farm publications			

Achievement motivations (n -Ach)	Maximum score	Scale value
	21	8.25

Every man has a desire to achieve certain things in his life. Incomplete sentences pertaining to desire of excellence are given here to do something well for its own sake rather to gain power, love or recognition. Kindly complete the following sentences.

Incomplete sentences

1. A farmer who adopted sustainable agriculture today should _____

2. A good organic agriculture farmer _____

3. If I had the worst farm in this area _____

4. The ideal man _____

5. I felt most dissatisfied when _____

6. Most of all I want _____

7. I used to day dream about _____

Information seeking ability	Maximum score	Scale value
	14	7.68

Among number of information sources listed below, kindly indicate whom do you contact for getting information pertaining to adoption of sustainable farming practices. Your, more or less frequent contact is to be informed (Scoring : Never = 0, less frequently = 1, more frequently = 2).

Information source	Never	Less frequently	More frequently
1. Neighbourers/relatives /friends			
2. Sustainable agriculture farmers			
3. News paper/ leaflets			
4. Radio/ Television			
5. Extension worker/ NGO			
6. Demonstrations/Field days			
7. Training programmes			

Risk taking ability	Maximum score	Scale value
	7	7.85

Some farmers take more risk, some others take moderate risk and more hesitate to take risk because sustainable farming is a risky business. The following statements formed based on ability to take risk. I request you kindly to give your opinion about the statement (Score Yes = 1, No = 0).

List of questions

1. i) Are you using only organic manure in agriculture **Yes / No**
 ii) If yes, name the crop grown and type of organic manure used during last year

Name of the crop	Type of organic manure used
a)	
b)	
c)	

2. i) Do you use organic pesticides for vegetable crops ? **Yes / No**
 ii) If yes give details

Name of the crop	Organic pesticide used
a)	
b)	
c)	

3. i) Have you taken loan for farm improvement **Yes / No**
 ii) If not do you want to take it now ? **Yes / No**

4. i) Have you adopted any sustainable farming practice or any new variety of crop for the first time in your village. **Yes / No**
 ii) If yes, give details.

- a)
b)
c)

5. i) Have you stopped growing any crop due to price going down **Yes / No**

- ii) If not what crops you grow inspite of price fluctuation

- a)
b)
c)

6. i) Do you grow more than one crop on your rainfed areas? **Yes/No**
 ii) If yes, give details

	First crop	Second crop
a)		
b)		
c)		

7. i) Are you willing to try new sustainable practice when you heard about it over Radio/ Seen in TV/ Read it in newspaper **Yes / No**

ii) If yes, please give one or two examples.

- a)
 b)
 c)

Co-ordinating ability	Maximum score	Scale value
	10	7.50

In order to complete the required work in stipulated period, farmer has to harmonize and synchronise the various farm activities for better farming business. I request you kindly to respond (Scoring well in advance = 2, at the neck of the time = 1, do not considered= 0).

List Of Questions

- 1) Last year did you prepare organic farming cropping plan well in advance ?
 - a) prepared well in advance ()
 - b) prepared at the nick of the time ()
 - c) plan was not prepared ()
- 2) Did you estimate money required for cropping during last season, well in advance ?
 - a) Estimate was made well in advance ()
 - b) Estimation was made at the nick of the time ()
 - c) Estimation was not made ()
- 3) Last season did you procure seeds of HYV, well in advance
 - a) Procured well in advance ()
 - b) Procured at the nick of the time ()
 - c) Did not procure ()
- 4) During last year did you arrange for organic manure and organic pesticides well in advance
 - a) Arranged well in advance ()
 - b) Arranged at the nick of the time ()
 - c) Did not arrange ()
- 5) Did you consult extension worker of Govt./ NGO or specialist when you heard about incidence of pest attack on the crop in the village ?
 - a) Discussed as soon as incidence was heard ()
 - b) Discussed at the lapse of one week ()
 - c) Never discussed ()

Leadership ability	Maximum score	Scale value
	10	7.25

To get the things done properly, farmer has to initiate the action, motivate the followers and decision should be taken. Some statements related to leadership ability are given here. Please indicate the response (Scoring : Always = 2, some times = 1, never =0).

- | | | |
|--|--------------------------|--------------|
| | Yes | |
| | _____ | Never |
| | Always /some time | |
1. Do you offer new approaches to solve problems
in sustainable agriculture ?

 2. Do village people regard you as a good source
of information on sustainable farm practices ?

 3. Whenever you see a new sustainable farm practice
did you initiate discussion about it with your
colleagues ?

 4. Do you assign the organic farming work to your
family members/farm labourers ?

 5. Did you participate in discussion on sustainable
farm practices in the group meeting or in peer group ?